THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

Vol. XXXII. No. 813.] LONDON, DECEMBER 10, 1878. [30th Year.] Price 6d.

COOKE BROS.

See Page 869.

26, 27, & 28, FENCHURCH ST.,

LONDON, E.C.

GENUINE TORBAY PAINT
And SPECIAL GASOMETER PAINT.
Several Prize Medals. Established over 20 Years.
These Paints are now used in over 200 Country Gas-Works, and by all the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
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BROOKFIELD GAS APPARATUS WORKS,
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CONTRACTOR FOR
LAYING MAINS
FOR
Gas, Water, & Sanitary Purposes,
AND MANUFACTURER OF
WOOD GRIDS
FOR
SCRUBBERS AND PURIFIERS.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a Prize Medal was awarded at the Great Exhibition of 1851, for "Gas-Retorts and other Objects in Fire-Clay," and they were also awarded at the International Exhibition of 1862, the Prize Medal for "Gas-Retorts, Fire-Bricks, &c., for Excellence of Quality."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
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Jos. Cowen & Co. are the only Manufacturers of Fire-Bricks and Clay Retorts at Blaydon Burn.

JOHN RUSSELL & CO.,
LIMITED,
Established at the commencement of Gas Lighting,
Manufacturers of
TUBES AND FITTINGS.
THREE PRIZE MEDALS,
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Head London Office:
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OLD PATENT TUBE-WORKS, WEDNESBURY.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
Manufacturers of
WET AND DRY GAS-METERS,
Licensees and Manufacturers of
HUNT'S
PATENT COMPENSATING METERS,
STREET-LAMPS, &c., &c.
Established 1830.

THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM,
Manufacturers of
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
Sugar, Saltpetre, and all kinds of Pans.
Roofs, Girders, and Bridges, and General Smith's Work.

J. & H. ROBUS,
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FOR THE
ERECTION AND REBUILDING OF GAS AND WATER WORKS.
ESTIMATES FREE
FOR MAIN-LAYING AND GENERAL REPAIRS
RETORT-SETTING A SPECIALITÉ.
[illegible] IMPROVED RETORT-SETTINGS guaranteed to carbonize a large amount of coal with a small per cent. of fuel.
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JAMES M'KELVIE,
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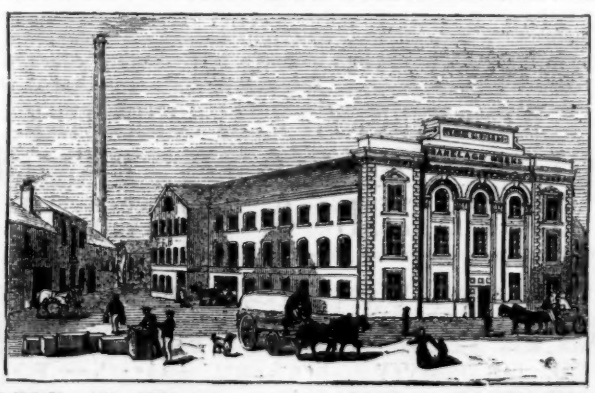
CHANGE OF ADDRESS.

GEORGE GLOVER AND CO.,

DRY GAS-METER MANUFACTURERS,
HAVE REMOVED TO MORE EXTENSIVE PREMISES:



RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.

SILVER MEDAL, PARIS EXHIBITION, 1867.

LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,
AND
COOMBS WOOD TUBE-WORKS, HALESOWEN,
MANUFACTURERS OF
WROUGHT-IRON TUBES AND FITTINGS,
AND
LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES,
UP TO FOUR FEET IN DIAMETER.

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EVERY DESCRIPTION OF TUBING, GAS, STEAM, HYDRAULIC TUBES AND FITTINGS,
EITHER BLACK, GALVANIZED, OR ENAMELLED HOT WATER TUBES AND FITTINGS,
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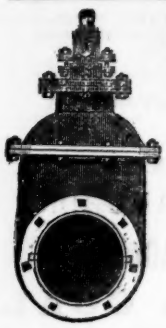
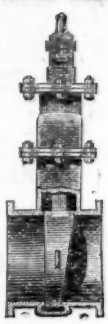
CHANDELIERS, &c., GAS-FITTERS' TOOLS, GAS TONGS, STOCKS, TAPS, DIES, &c., &c.,
HANDRAIL TUBINGS, IRON AND BRASS, PLAIN OR TWISTED,
TELEGRAPH TUBES OR POLES, &c., &c.



C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves have taken the place of the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.

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GAS APPARATUS;
CONTRACTORS FOR THE
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The only Prize Medal awarded for TUBES & FITTINGS.

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SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

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HYDRATED PURIFYING MATERIAL.

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ALSO PATENT DRY COPPERAS FOR EXTRACTING AMMONIA.

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THE

STANDARD WASHER AND SCRUBBER.

[KIRKHAM, HULETT, AND CHANDLER'S PATENT.]

Some of the advantages claimed for this Apparatus are as follow:—

The Exposing of a large Amount of Effectually-wetted Surface (which is continually reproduced) to act upon the Gas.
Unerring Regularity in the Distribution of the Liquor.
Saving of Expense in Providing and Exchanging Scrubbing Material—none being required.
Economy of Space, thus enabling the Apparatus to be protected from the Weather.
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It works without Pressure.
It is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured.

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Issued Semi-Monthly at No. 42 Pine Street, New York City.

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This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

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Full particulars will be sent on application to above address.

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Are Buyers of SULPHATE AMMONIA in Large or Small Quantities, or Sell on Commission for Gas Companies and Makers.

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S. C. & Sons undertake the entire erection of New, or Remodelling of existing Gas-Works in any part of the World, including small Works for MANSIONS, FACTORIES, &c., or Works of the largest extent (are now constructing the largest Gasholder yet erected); also the supplying and laying of MAINS.

They make a speciality of supplying every requisite whatever for Gas-Works, keeping in Stock what are most in request. WOOD SIEVES for Purifiers and Scrubbers, of a superior make.

SPECIAL CASTINGS to Drawing or Pattern at Shortest Notice.

Manufacturers of MORRIS & CUTLER'S PATENT CONDENSER & CUTLER'S PATENT GAS-WASHER.

DESCRIPTION OF MORRIS & CUTLER'S PATENT CONDENSER.—The Condenser may consist of pipes arranged in tiers, or in any other form most convenient to the site available, each tier being connected with special connections, and containing within same either one or more coils of smaller pipe through which water is passed, being supplied from any convenient source of supply, the water passing in an opposite direction to the gas, so that the coldest water is at the gas outlet. The power of the Condenser can be regulated precisely in proportion to the quantity of water allowed to pass through, which is not in any way contaminated, but simply heated by the hot gas, and advantage can be taken of its being at a high level to carry it to a high-level cistern, from whence it can be used for supply to boiler or any other purpose. The Condenser itself may form the support for a high-level cistern. By an arrangement of valves the water may be shut off, and an air orifice opened, when air will pass through instead of water, or both air and water can be shut off. The power of the Condenser is, therefore, entirely under control. The Condenser may be seen in operation at the Brentford Gas-Works.

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ROUND STATION-METERS,

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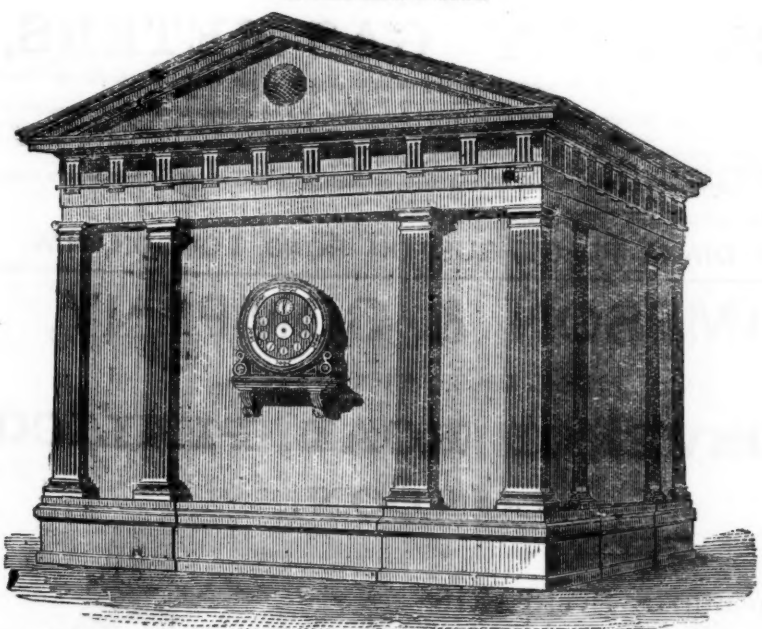

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GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

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Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

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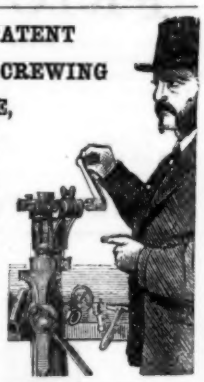

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In use at the chief gas-works, and giving great satisfaction.

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The only Gold Medal awarded for "Apparatus and Processes for Heating and Lighting" by the Imperial Commissioners

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The following Medals were also awarded at Paris, 1878:—

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GOLD MEDAL (Rappel) for Metallic Bedsteads and Furniture.

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INVENTORS AND PATENTEES

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Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

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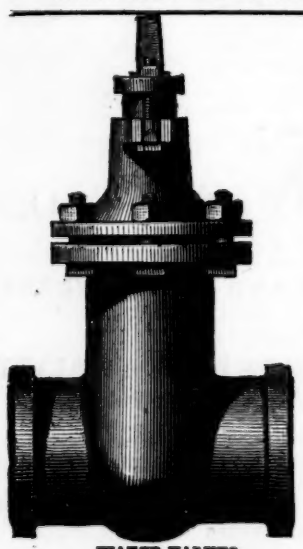

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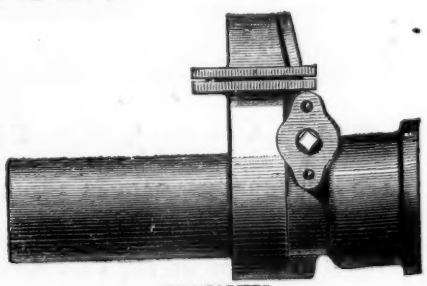
SCREW-COCKS, HYDRANTS,

SLUICES, PENSTOCKS,

And all other Machinery for

WORKS OF WATER SUPPLY, DRAINAGE AND IRRIGATION.



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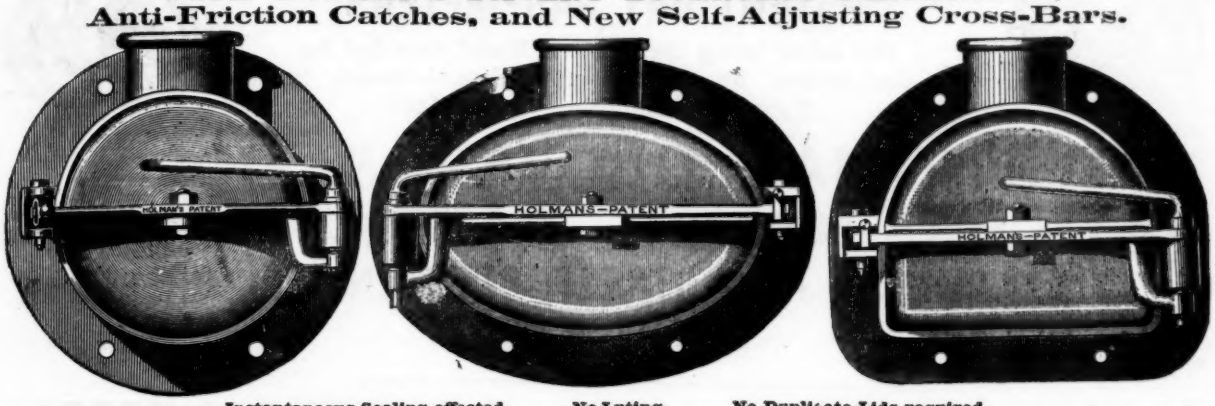
(LATE OF 10, LAURENCE POUNTNEY LANE.)

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.

D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

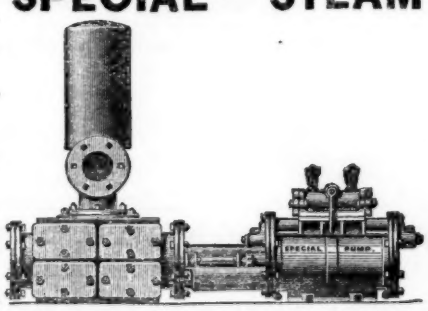
Yours truly,

(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION.

THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	20
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

TANGYE'S HIGH-PRESSURE AND CONDENSING STEAM-ENGINES; CORNISH, VERTICAL, & TUBULAR BOILERS; HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, ETC., ON APPLICATION.

London, 1851 New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.

(ESTABLISHED 1816)

ARE THE ONLY MAKERS

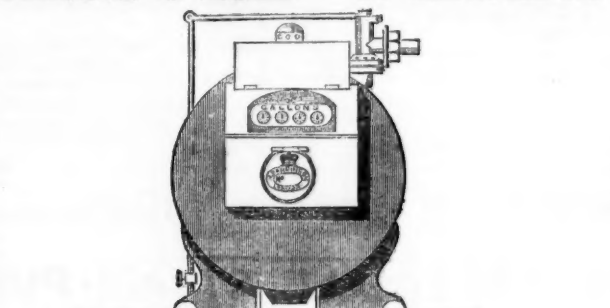
OF THE

LOW-PRESSURE WATER-METER.

These Meters will register with perfect accuracy, either at full speed, or with a few drops only passing through them.

They must be placed over the cistern to be supplied, and the water, after being measured, will fall from the outlet into the cistern below. Each Meter is fitted with a ball-valve, so made that it can be adjusted to shut off the supply at the inlet when the water reaches any required height in the cistern.

The 100-gallon Meter is fitted with a cistern holding about three or four gallons, and may be fixed inside a house, free from the effects of frost, and requires no attention after once being fixed.



From "The Engineer," April 6, 1877.

"Low-pressure Meters have been found to register with almost perfect accuracy, or, at all events, within 5 per cent. either for or against the consumer, and from the nature of their construction are by no means easily deranged. Still, even the low-pressure meters have their disadvantages, but these are chiefly as respects the question of first cost, seeing that they must have a cistern fixed at a higher level than that at which the supply is needed. All things considered, however, the balance of opinion rules at present in favour of the low-pressure Meter, and they are consequently increasing in favour as time goes on."

These Meters have been manufactured by W. P. & Co for more than 25 years, and are largely used by the following and other Water Companies:—

NOTTINGHAM, DERBY, LEICESTER, SUNDERLAND, GREAT YARMOUTH, SHEFFIELD, NORWICH, LOWESTOFT, COVENTRY, SOUTHEND.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

J. D.—*The prices given, in the paragraph to which you refer, are only for the lighting, extinguishing, cleaning, and repairing the lamps, the gas being charged for separately.*

"THOMAS BARTHOLOMEW."—*We regard your ideas as purely chimerical, and cannot afford space in the* JOURNAL *to publish your communication.*

A. H.; C. T.—*Thanks for your hints.*

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 10, 1878.

Circular to Gas Companies.

THE electric light continues to attract a large amount of public attention. Great crowds gathered at the Society of Arts, on Wednesday evening last, to hear Mr. Shoolbred's discourse "On the Practical Application of Electricity to Lighting Purposes," and to witness his experiments with the various electric lamps now before the public. The lecture-room was full almost to suffocation, the lobby was densely packed, and the staircase was occupied down to the street, where there was a surging crowd, whose impatience to gain admission led, we are told, to some free fights. Mr. Shoolbred certainly delivered a highly instructive lecture, but his experiments cannot be said to have been very successful. The interest of the evening centred in the discussion which followed the reading of the paper. The most notable among the speakers was Dr. C. W. Siemens, who took the chair on the occasion. It is unnecessary for us to notice, at any length, the opinions of all those who spoke, but we shall refer to one or two whose ideas appear to have the greatest importance. It was a general belief that the electric light would never supersede gas. Even Dr. Siemens does not believe that gas will ever give way to electricity. He said that "he had heard a great deal about inventions for sub-dividing the electric light indefinitely, but he did not attach great importance to that, as the electric light would not take the place of gas for our streets or in our houses, though it would come to be largely used for lighting halls and large public places of every description." As to this, we believe that all who have studied the subject are fully agreed; at all events, no speaker at the Society of Arts meeting ventured to suggest that the electric light would ever become a rival to gas. On the contrary, the general impression appeared to be that the two might work harmoniously together, and that, supposing the worst to be realized, gas might be employed, directly or indirectly, to furnish the mechanical power necessary for the production of the light.

In the experiments made at the Society of Arts, the lights were anything but steady. This was accounted for by the fact that the steam-engine driving the electric machine was being worked at irregular pressures. To produce an unvarying light, it is absolutely essential that the dynamo-electric machine should be driven at a uniform speed. Herein lies a difficulty which the purveyors of the electric light will have to encounter. Every boiler will require rigid supervision. A stoker must have his eyes continually on the pressure-gauge, for a very slight difference in the pressure will bring the dynamo machine to a standstill, and then out will go the electric light.

Several questions were asked about the means used for determining the illuminating power of the electric lights. Our columns recently contained accounts of the method adopted by Mr. Sugg, at the Chartered Company's Offices, Horseferry Road, and a mention of the selenium photometer, which is being used by Mr. Willoughby Smith, the well-known Electrician to the Telegraph Construction and Maintenance Company, was made in the JOURNAL, when speaking of the Werdermann light. Mr. Sugg's means we regard as eminently practical; but no reply was made by Mr. Shoolbred to the questions of Mr. F. W. Hartley and Mr. W. H. Bennett. We are, therefore, left in the dark as to the method generally employed for this purpose.

The recent experiments with the electric light at Billingsgate Market were, we are told, continued during business time in the early dark hours. If we are correctly informed, the exhibitions gave but little satisfaction. Facetious "Bummarees" provided themselves with tallow dips, which they stuck in blacking-bottles, or whatever other extemporized candlesticks they could find, and distributed them amongst their stock on the stalls, so as to assist the retailers in deciding on the quality of the fish. We look forward with much more interest to the experiments about to be made on the Holborn Viaduct and the Thames Embankment, the preparations for which, we understand, are far advanced. The display of the Werdermann light in front of the Mansion House will be of scarcely less importance. That neither light will prove economical in London we feel convinced, for in Paris, where gas is twice as dear as it is here, it is recognized that electricity costs about five times as much as an equal illumination by gas. This is not encouraging to inventors; but we are continually promised that in a short time the present cost of the new light will be reduced by one-half.

The electric light was introduced to the notice of the Manchester public at a concert given in the Free Trade Hall last Saturday evening. As we have said before, all first attempts with the electric light prove failures, and this exhibition was no exception to the rule. The light flickered, and joined discordantly in the choruses. In the end it had to be extinguished and the gas lighted, but not before a wag had lit up a small tallow candle, and hoisted it above the heads of the audience, with a result easily to be imagined.

That charming little watering-place, Westgate-on-Sea, has been treated to a sight of the electric light, under the auspices of the chief landlord and house proprietor in the neighbourhood. The display consisted of six lamps along the beach, and it was admitted on all hands that the lights were eminently successful, and afforded much gratification to a small crowd of gentlemen who went down from London to witness them, and who, in addition, partook of Mr. Davis's hospitality. Among the company present, who witnessed the display and afterwards spoke at the banquet, there were evidently no two opinions as to the position that electricity would hold in relation to gas. Electricity may light up the Marine Parade and the subways of Westgate, but it will never penetrate the bungalows. So much it is gratifying to learn, on the authority of the Rev. E. Gripper Banks, whilom the determined enemy of the Ramsgate Gas Company. To these experiments, we can, of course, offer no objection. All we ask for, in view of a rivalry which does not exist, is a fair field and no favour. We know the illuminating power of the electric light has been enormously exaggerated; but presently, when test experiments now projected to be carried out in London are carefully superintended, we shall be better informed. This fairness is perfectly ensured at Westgate, and when the month's experiments are concluded, we have no doubt a truthful statement as to their cost will be rendered.

The Corporation of Manchester have recently been a little exercised as to the disposal of their residual products from the manufacture of gas. The matter came up on the question of confirming or not a ten years contract for the sale of the ammoniacal liquor. We have a strong objection to contracts for so long a time as this, but they may sometimes be advantageous. Another rich deposit of guano being discovered, the manufacturer of sulphate of ammonia may be ruined; and, on the contrary, guano deposits being exhausted, the manufacturer of sulphate may make his fortune, and leave the Gas Companies to earn their profit out of the gas supplied to consumers. If it be true, as one Councillor stated, that the Gas Committee of the Corporation have, for the past ten years, lost £50,000 per annum on the sale of their residuals, it is quite time the matter was thoroughly looked into. The same Councillor says that the Manchester Corporation obtain for their residuals only about one-half of what the London Gas Companies receive. He doubtless overlooks the fact that the sales of Manchester coke bring only a very small return, while the London product is a most valuable combustible. Tar and liquor ought to be of about the same value in Manchester as in London, and we are astonished to see so large a difference in the amounts received for them.

We commence to-day the publication of a report of the proceedings at the annual meeting of the American Gaslight Association. The Inaugural Address of the President, General Charles Roome, as a rhetorical effort, was very successful. As much may be said for Major Dresser's paper "On London Gas Companies." The writer evidently gave close attention to English institutions during his stay in this country, and carried back with him a fund of knowledge to communicate to his fellow-citizens in New York. The account which Major Dresser gives of the Metropolitan gas stations is very fair, and not at all calculated to excite enmity in the minds of engineers. He pays a full tribute of respect to the colossal works at Beckton, and notices with favour smaller stations where excellent results are obtained. On the whole, our American visitors seem immensely gratified by their reception and treatment both here and in Paris. These international gatherings are extremely delightful, and we hope that beneficial results, both to Consumers and Companies, will follow them.

The Gas Committee of the Corporation of Nottingham are availing themselves of the opportunity afforded by the promotion of an Improvement Bill, to obtain power to acquire additional land for the extension of their works at Radford. The consumption of gas at Nottingham appears to increase in a remarkable manner, and it is evidently essential that facilities for an extended manufacture should be provided.

Mr. Marks, of the Isle of Sheppy Gas Company, is doing his best to promote the further consumption of coke, and for this purpose has issued a flying sheet, entitled "How to Use "Gas Coke"—we may add, in common grates. The trick is simple enough. Break up your coke into small fragments, and you will have no difficulty in lighting a coke fire, or in keeping it going.

The Town Council of Newcastle, and that also of Gateshead, have determined unanimously to oppose the Gas Company in their endeavour to obtain further powers in the course of next session, the principal one asked for being the right to supply the electric light. If pressed upon the point, the Company might very well relinquish their proposal to obtain this not at all important concession. The electric light is not likely either to make or mar a Gas Company.

Water and Sanitary Notes.

The Bill which is intended to empower the Metropolitan Board of Works to acquire the undertakings of the Metropolitan Water Companies, was introduced to the notice of the Board at their meeting last Friday, with a recommendation from the Parliamentary Committee that it should be deposited forthwith. There is on the Board a very powerful minority who are strongly opposed to the purchase, and who succeeded in persuading the Board to defer the consideration of the matter for another week. This will leave plenty of time, for the Bill need not be deposited before the 17th inst. Moreover, the Board have had an interview with the Home Secretary, with the object of ascertaining whether or not the Government would support the measure when introduced. Mr. Cross has not yet announced the decision of the Cabinet; but has promised to send it in time for the deposit of the Bill, if the reply should be favourable to the intentions of the Board. We cannot believe that the Government will interfere at all in the matter. They will, we expect, leave the Board to do just as they please. The water purchase question is one on which the opinions of all the members of the Government may not be in accord. The Cabinet, we have little doubt, will be quite unanimous in rejecting the measure; but still some deference is due to the opinions of colleagues outside. We anticipate, then, that a somewhat evasive answer will be received from Mr. Cross, and that next Friday the real struggle will be entered upon between the members of the Board.

In the debate which took place in the Board last Friday, the opponents of the scheme had nearly all the speech-making to themselves, and we are bound to say that they acquitted themselves very well. The Metropolitan Board could not, for very many years, make a profit out of the water undertakings, even if they became possessed of them—for that they would have to wait; but, as certain as London is growing, they would, in time, realize a large excess of revenue over expenditure. When a veteran local politician and economist like Mr. H. L. Taylor opposes a measure, we may be satisfied that there is a great deal to be said against it. On the subject of purchase, Mr. Taylor's opinions are very pronounced. He will have none of it, but he is in favour of the introduction of a Regulation Bill—a measure we should like to see drafted. We entertain an idea that the Metropolis Water Act of 1871 gives the Board all the power they need possess to render the water supply of the Metropolis pure and efficient for all purposes. What more they can want we do not understand; but, as a matter of fact, the Board have persistently shirked all the duties imposed upon them by the Act above mentioned. They have sulked because Parliament did not give them as much control over the Companies as they could have obtained by purchase. Next Friday we shall learn more about the matter, and, in the meantime, the Water Companies need not be at all anxious. It may be just mentioned, in passing, that none of the members of the Board appear to have obtained any information as to the amount expended in the promotion of the two Water Bills put forward last year. Is it possible that secrecy is maintained, so that the Vestries may not remonstrate before the Bill now under discussion is deposited?

The condition of the Thames near the sewage outfalls is likely to continue a matter of dispute for some time to come, and we fear that nothing will settle it but a Royal Commission, with all its accessories and expenses. If the question cannot be decided without such proceedings, we have nothing to say against them; but it does seem to us strange that the Thames Conservancy Board cannot, with their Engineers, assisted by a competent Assessor, settle the matter within a week. A notable man has entered the lists, in the person of Mr. Stanley Jevons, who quotes from Mr. Sterry Hunt the fact that clayey particles, the settlement of which it is so extremely difficult to effect in fresh water, are at once precipitated so soon as they come in contact with water that is brackish. If this be the fact, the cause of mud-banks in the Thames, in the neighbourhood of Barking and Crossness, is easily explained.

The accounts of the Southwark and Vauxhall Water Company have been issued, in anticipation of the Half-Yearly General Meeting to be held on the 12th inst. The Company, having a sufficient balance in hand, recommend the payment of a dividend at the rate of four per cent. per annum on the ordinary, and five per cent. per annum on the preference stock. The works are at the present time in excellent order, and the large expenditure which has for the last few years been incurred for new reservoirs and filter-beds will now cease. The business of the Company increases every year, and we hope, notwithstanding the action of the Metropolitan Board of Works, soon to have to congratulate them on earning a larger dividend.

Patronized by a great Duke and all the lackeys he can command, it is no wonder that Scott's plan for the treatment of sewage, to form Portland cement and manure, flourishes up to a certain point. From the annual report of the Directors, read at the meeting held at Stafford House on the 3rd inst., we learn that Scott's system is at present in operation at two places—Burnley, where cement is made; and Rochdale, where manure is manufactured. At Burnley the Directors consider it a great triumph to make ten tons of cement per week, which, sold at £2 per ton, brings in £20 per week. Sir H. Cole, C.B., would be glad to see much more produced, but the works are not of sufficient capacity to allow of a larger make. If we remember rightly, there is a little dispute going on between the Company and the Corporation, as to who shall make the extensions, each wishing the other one to undertake the task. But, notwithstanding the ducal patronage, money, in the shape of capital, comes very slowly into the coffers of the Company; nor is there much to be done in the way of making extensions out of realized profits, for we understand that Burnley cement, at £2 per ton, does not pay its expenses, while thousands of tons of manure lie at Rochdale, waiting to be carted away when the Corporation will pay the cost of its removal. Never-

theless, there is no lack of energy on the part of Sir H. Cole. He tells us that at the present time he is in treaty with one hundred and thirty other places in Lancashire, and he does not hesitate to attempt to persuade the Metropolitan Board of Works to allow him to try his "'prentice hand" on the treatment of Metropolitan sewage at the outfall. We fear that the Board will not allow the Company to ruin themselves, as they seem to have an eminent desire to do. In the meantime, Mr.—or we should rather say Lieut.-Col. Hope has once more come to the fore with a revival of his scheme for the reclamation of the Maplin Sands. He tells the Metropolitan Board that he and his friends have two million pounds waiting to be employed in sewage works and sewage farming. We rather think the Metropolitan Board will stand up as the protectors of Mr. Hope's friends, and will not allow this large sum to be almost literally thrown into the gutter.

We are glad to learn that there is no intention on the part of the Corporation of Nottingham to attempt a compulsory purchase of the Water Company's undertaking. The notice is only given in order to obtain for the Town Council a *locus standi*, so as to oppose the Company's Bill on some points of small importance.

THE THAMES CONTROVERSY.

It is an article of faith with most of the organs of public opinion, that the sewage of the Metropolis is rapidly polluting and silting up the River Thames. The Metropolitan Board of Works have made an appeal to the senses, and the answer is that the test is not scientific. Previously there was scientific evidence in opposition to the popular view, and it was then objected that such evidence was inconclusive. Sir Joseph Bazalgette doubtless thought he had conceived a happy idea when he proposed that the members of the Board, and the representatives of the leading journals, should have a trip down the Thames at a suitable period of the tide, and judge for themselves as to the state of affairs. If the river were foul and feculent, the fact could not be difficult of discernment, whether by the sense of sight or smell. If the mud-banks were there, they could be found, and when found it would be possible to tell, without refined analysis, whether or not the mud was of the nature of sewage. Accordingly, there were two excursions, on successive Saturdays, from London Bridge to the vicinity of Gravesend. The first start was made just before high water, so that Barking and Crossness were reached at the turn of the tide, when the sewage was being discharged from the outfall reservoirs. Having approached Gravesend, the boat turned, and came up against the tide, so as to meet the descending sewage. The general result showed that, so far as odour was concerned, nothing offensive emanated from the surface of the water, and, so far as the constitution of the water was concerned, there was nothing in the shape of sewage perceptible to the senses, beyond a very short distance below each outfall. With the exception of this limited range, the water was apparently the same, *quoad* sewage, all the way from London Bridge downwards; the only marked difference being the gradual increase, in the admixture, of sea water, which was, of course, more apparent according as the distance from the sea grew less. As for mud-banks, these existed in places, as might be expected; but the presence of actual sewage mud was only manifested within about a hundred yards of the outfalls, and the quantity of mud of all kinds in the river, as indicated by the relative proportion of deep and shallow water, showed a marked improvement compared with the years antecedent to the outfalls. Official charts, of unimpeachable authority, showed that the main channel of the river was much more clear of shoals in 1871 than in 1857, and that the Thames is now much more accessible to vessels of deep draught than it was twenty years ago. Respecting the origin and growth of mud-banks, the company on board the steamboat had an opportunity, on the occasion of the second expedition, of seeing how mud could be manufactured at the fastest possible rate. This second journey was taken at low water, and it needed no especial clearness of vision to detect the enormous wearing away of the river banks wherever they were left in an unprotected state. There are immense areas of marsh land, or "saltings," on either side of the Thames below Barking and Crossness. The soil is a soft alluvial deposit, so that a pole plunged into the ground in many parts of the open field has more difficulty in finding a firm bottom than if thrust into the river itself at low water. Every rivulet that flows into the river —and the streams are many—carries a heavy load of earth with it. Every wave that laps the banks, be the ripple ever so small, takes away a portion. Every steamboat lashing the water with its paddles, or troubling it with its screw, sends an undulation to the banks, which helps to undermine a mass doomed, sooner or later, to fall on the foreshore, and waste away into the restless river. All this goes on, whether the tide be going down or running up, and some of this process was seen by the company on board the boat while exploring the lower reaches a few days back. They also knew, by the action of the sounding-pole, that much of the river-bed near the outfalls was hard, clear gravel. Even the marshes melting away on the river side appear to do but little harm. Still less is the sewage likely to choke the stream. If the latter can inflict such mischief, much more can the former, both in regard to bulk and indestructibility.

Despite the facts, opinions contrary to the facts still survive. Sir Joseph Bazalgette required on board his boat not only those representatives of the Press who perform the responsible duty of recording what they see and hear, but also those gentlemen who wield the editorial pen, and who are apt to "give to airy nothings "a local habitation and a name." Brilliant leader-writers still declare that the fumes which occasionally assailed the steamboat party on its flood-tide expedition, proceeded, not from the factories on shore, but from the water on which the vessel floated. The leading journal, more cautious in its utterance, but hampered with a little difficulty in having given some previous countenance to Captain Calver's plausible speculations, framed a finely-pointed sentence to disguise a fact which the public ought to understand. The reader was thus asked to "doubt the assertion, so confidently made by many persons, that "the solid matter contained in the Metropolitan sewage, by "virtue of some action which has been left unexplained, has not "obeyed the laws which govern solids generally, but has made "away with itself, as if by the operation of a sort of physical "modesty, without occupying space." If this pretty piece of writing means anything, it involves two propositions—first, once a solid, always a solid; secondly, once sewage, always sewage. That is to say, we may burn our candle at both ends, and not only keep our candle in the shape of gaseous products, but as a solid candle still. We may burn a sack of coals, and the coals are still somewhere, not merely as finely divided carbon and sundry gases, but as veritable coals still waiting to be burned. Such we must now suppose are "the laws which govern solids "generally," and which govern the Metropolitan sewage in particular. Creation is a box of bricks, devoid of all power to undergo chemical change. It would be a dull world on such principles, and we need hardly say that such a world is as yet unknown to science. If things were thus immutable and unconvertible, we should soon have the world all sewage, and man would lack both food and drink. The elements of sewage doubtless continue to exist, and it is well they do, for if matter could "make away with itself, without occupying space," the world would soon be nowhere. But, at the same time, we are rather pleased with the phrase which ascribes to Nature a "sort "of physical modesty." This, which is assumed to be a fallacy, is partly true. Nature is so far modest that she attacks whatever is inherently foul, and proceeds to demolish it, for the purpose of taking the refuse materials and building them up into something pure and profitable. Such is the whole theory of sewage utilization. As the London sewage is not utilized, there is a natural process at work to destroy it. If it smells offensively—as it will when concentrated—there is a proof of its volatility. If it makes mud-banks, so far it is not volatile. It does both, say the objectors. But they must admit that the gas which flies off in the air does not make mud-banks in the river. Neither does that which enters into the constitution of the mud-banks, likewise float at the very same moment, as gas, in the air above. We must do justice, even though the subject be sewage. The culprit cannot be in two places at one time, committing two separate and distinct offences. The more the gas, the less the mud. The more the mud, the less the gas.

Salt, say the objectors, gets up to London Bridge, and why not sewage? For two reasons, if there are not more. First, the sea is salt, and the flood tide is from the sea, whereas the sewage starts with the ebb. Secondly, salt does not "make "away with itself," as sewage does. Let us take a bucket of salt water, and a bucket of sewage. Let the two stand uncovered side by side. A year hence the salt will still be found in the one bucket, but what of the sewage in the other? Captain Calver talks of "twenty-one days sewage" existing in the "sewage zone" of the Thames. One would imagine that sewage was made of deal boards, which went floating up and down the Thames like the dead horse which is said to have haunted Woolwich Reach for a month. Sir J. Bazalgette knows as well as anybody how a wooden float will oscillate with the tide, and hang about the neighbourhood where it set out. But sewage is not a wooden thing. It is a compound matter, capable of being rapidly decomposed. Sewage is not a thing to be kept. It is determined to "make away with itself,"

whether we like it or not, and it is by no means disposed to go journeying up and down the river for a period of three weeks or more. If the Thames were a little river, the London sewage poured into it would be an insufferable nuisance. But the Thames is a big river, and the existing proportion between the river and the sewage is such that the latter is drowned in the former, so that if not literally washed into cleanliness, it is so dissolved and decomposed that its identity becomes a question for the chemist rather than the hygeist or the hydrographer.

One of the things to be wondered at in London is the very little which Londoners know about the city they live in. Every man has his own business to attend to, and his own circle to occupy, beyond which his knowledge must come second-hand. Every man reads the daily papers, and he trusts to these to keep him posted up in general information. But what do most respectable Londoners know about the matters which daily concern them? It is not merely that a man does not know his next-door neighbour, but he scarcely understands that which appertains to his own dwelling. He often says he does not know who manages local affairs, and what becomes of the money he pays to the rate collectors. Perhaps he is supplied with the hard chalk water of the Kent Company, and carefully filters it, lest he should imbibe typhoid fever from Oxford sewage. He burns gas, and declares that he can smell the sulphur. Going out of doors, he looks on the Thames with abhorrence, and believes it the home of all pollution. How few are conscious of the fact that the Thames below Teddington is undergoing a great and important change. The Thames is not what it was, in any sense of the word. How few are aware that the average quantity of water passing over Teddington weir is more than a thousand millions of gallons per day, and all this must get away to sea somehow, or the laws which govern liquids must certainly be subverted. All this water goes down, and yet somebody believes the sewage comes up. There are people who seem to imagine that sewage can pass up the stream so as even to surmount a weir, like a salmon going up a ladder. Yet these people must surely believe that, although the tide comes up the Thames to a certain point, it afterwards goes down again. The greater the volume that comes up the river, the more there must be to descend it. The more we open the way for the tide, the more freely will the tide come up. Let the channel be deepened, and the tide will flow in greater volume, raising the level of high water. Rising higher and growing deeper, the tidal volume has yet no more time in which to travel than before. The higher the flood, the lower the ebb; and the greater the volume, the greater the scour. All this is going on in the River Thames. The removal of old London Bridge inaugurated a new era. The change from the old bridge to the new had the effect of lowering the level of low water just above the bridge by as much as five feet, and the effect was felt in a modified degree higher up the stream. Shoals were laid bare which had not formerly been observed, and dredging operations followed, which had a further effect. The scour of the river was increased, so that Blackfriars and Westminster bridges began to fail at their foundations. The bridges were in consequence reconstructed, and in each instance the new bridge offered less obstruction to the stream than the old one. The tide, therefore, gained above London Bridge, and the scour continued to increase. The Thames Embankment both smoothed and narrowed the passage, thereby helping matters on a little farther. The influence extends below bridge as well as above. It has been found necessary to raise the quays of the Millwall and Victoria Docks. Even in the construction of the Thames Embankment, Sir J. Bazalgette deemed it advisable to raise the level six inches above the line laid down in the original design. The floods on the river side in Southwark and Lambeth, as well as at other points, seem to tell the same tale. Recently we have heard that Waterloo Bridge is seriously undermined. Costly and troublesome as some of these results may be, there is satisfaction in the thought that the river is made all the purer by the increasing head of water in its tidal portion.

We may cite the evidence of Captain E. Burstal himself, in support of some of the views which we have thus advanced. Going back to the year 1866, we find the Secretary to the Thames Conservators giving evidence before the Rivers Pollution Commissioners of that period. He states: "There is "no doubt about this, that since the removal of London "Bridge a great volume of water has found its way down "through the pools, and assisted to scour the detritus more "seaward than it did before, because London Bridge heaped "the water up to the extent of five feet; therefore, there is "all that depth of water, multiplied by its breadth and length, "to go out to sea." With equal distinctness Captain Burstal goes on to say, "I think that all material held in suspension "is carried away with the flow of the stream; there is very "little deposit anywhere, except in bays where neither the flow "nor the ebb has been sufficiently strong to carry it away." Questioned concerning the outfall works, Captain Burstal told the Commissioners—"The sewage should be discharged at a given "time, just before or not far from high water. It might then find "its way a little up to Woolwich; but the next ebb tide would "take it away, *and it would never be seen again.*" Being asked if he thought the Thames was ever a very bright stream, Captain Burstal replied: "If you mean pellucid, I should think not; "but there is no doubt of this, that it was far cleaner before "steamers were invented than it has been since; it is the steamers "that stir the shore up. If you go down the river, and watch the "action of a wave made by a paddle-wheel steamer, it is something "frightful; it will tear away masses as large as this table from the "saltings, and the rebound mashes the muddy portions up; at "least, it mixes up the muddy portions with the water, and makes "the water turbid." The actual survey of the river banks, made early this year by Messrs. Law and Chatterton, appears to warrant a belief that a million tons of earth are thus swept annually into the Thames below Woolwich. The river is widening sensibly in several parts, as indicated by the change in the position of the beacons. The solid matter thus washed away from the banks amounts to at least fifteen times the quantity contained in the sewage, which again is capable of being largely resolved into gases and water. Nevertheless, we see no signs that the controversy will terminate. Despite the evidence of their own Secretary, given nearly thirteen years ago, the Conservators have stirred up this troublesome question, and have excited public opinion in a fashion which threatens either a costly struggle leading to nothing, or a gigantic outlay to execute an unnecessary enterprise.

Correspondence.

THE WEIGHTS AND MEASURES ACT, 1878.

SIR,—I have not noticed in your columns any allusion to this Act which comes into operation on New Year's Day.

Sec. 19 provides that—

"Every contract, bargain, sale, or dealing, made or had in the United Kingdom for goods sold, delivered, or agreed for by weight or measure, shall be deemed to be made and had according to one of the imperial weights or measures ascertained by this Act, or to some multiple or part thereof, and if not so made or had, shall be void; no local or customary measures, nor the use of heaped measure, shall be lawful."

"Any person who sells by any denomination of weight or measure other than one of the imperial weights or measures, or some multiple or part thereof, shall be liable to a fine not exceeding forty shillings for every such sale."

Sec. 15. "The unit or standard measure of capacity, from which all other measures of capacity, as well for liquids as for dry goods, shall be derived, shall be the gallon containing ten imperial standard pounds weight of distilled water, weighed in air against brass weights, with the water and the air at the temperature of 62° Fahrenheit, and with the barometer at 30 inches. Eight gallons shall be the bushel, and thirty-six such bushels shall be the chaldron.

Sec. 16. "A bushel for the sale of any goods which before the 9th of September, 1835, were commonly sold by heaped measure, shall be a hollow cylinder having a plane base, the internal diameter of which shall be double the internal depth, and every measure, used for the sale of any of the above-mentioned articles, which is a multiple of a bushel, shall be made of the same shape and proportion as the above-named bushel."

Does not the sale of coke come under this 16th section?

Sec. 17 provides that—

"In using an imperial measure of capacity, the same shall not be heaped."

Sec. 22 is as follows:—

"Nothing in this Act shall prevent the sale, or subject a person to a fine under this Act for the sale, of an article in any vessel, where such vessel is not represented as containing any amount of imperial measure, nor subject a person to a fine under this Act for the possession of a vessel, where it is shown that such vessel is not used nor intended for use as a measure."

Does this section permit the continuance of the sale of coke measured at the gas-works in the ordinary sack of three bushels?

Under secs. 40 and 43, local authorities are to provide such local standards as may be requisite for the purpose of comparison by way of verification or inspection, &c., and to appoint inspectors.

In the second schedule to the Act, the brass gallon marked "Imperial Standard Gallon, A.D. 1824" (which has a diameter equal to its height), is deemed to be a Board of Trade standard for the gallon.

There is no provision in the Act for a measure larger than a bushel. Is coke, which is sold by the sack of three bushels, or by the chaldron of 36 bushels, to be measured in *bushels?*

A sack of three bushels is not a recognized measure under the Act. Are we, therefore, to measure out all our coke bushel by bushel? This may be very well in small gas-works; but how is this possible in moderate-sized works, except at an enormous cost for labour, and detention of vans, carts, or barges? And what is our remedy, assuming that local authorities refuse to provide a standard "sack" or "chaldron" measure?

If a standard "sack" measure is provided, it must be the multiple of the bushel, with the internal diameter double the internal depth. How will it be possible to use such a measure to fill a coal sack?

It seems to me that a representation should be made by Gas Companies to the Board of Trade, to authorize the use of a hemp sack of approved internal dimensions, or we shall all of us be in a fog on New Year's Day.

R. H. JONES.

Dover, Dec. 7, 1878.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

FRIDAY, DEC. 6.

(*Before the* MASTER OF THE ROLLS.)

DICK *v.* QUICK.—THE ANTWERP WATER-WORKS.

Mr. INCE, Q.C. (with whom was Mr. TERRELL), moved for a receiver in the partnership of Dick and Quick, which was formed for the purpose of making water-works at Antwerp. He stated that the plaintiff had negotiated from the Municipality the concession, which was granted in June, 1873, and it was arranged with the defendants, Joseph Quick and Son, that they should carry out the works, and that the profits should be divided equally between them. There were now difficulties with regard to finding sufficient capital to complete the works, and it was feared the concession would be forfeited.

The MASTER of the ROLLS asked how near the works were to completion.

Mr. INCE said a great deal had been done, but much yet remained uncompleted.

Mr. DAVEY, Q.C., who appeared for the defendants, said £40,000 had been spent, besides the caution-money, £10,000. They were now really at the mercy of the Municipality. £50,000 had been expended by his clients, and not a shilling by the plaintiff.

Mr. INCE said the concession was obtained entirely by two years constant labour on the part of his client.

The MASTER of the ROLLS asked what the plaintiff wanted to do.

Mr. INCE said the plaintiff and defendants could not agree as to what should next be done; besides which defendants were very reticent in the matter of accounts, and they were not persons with whom capitalists seemed inclined to co-operate. Under these circumstances, he asked that a receiver should be appointed. He was instructed that there were persons prepared to purchase the concern at a profit.

Mr. DAVEY said these persons would not give their names.

Mr. INCE said, on the other hand, the defendants wanted to make arrangements with the Municipality which would reduce the profits to *nil*.

The MASTER of the ROLLS asked if Mr. Davey's clients would act as receivers, without salary and without security. That was his general practice in partnership cases where one of the parties had found all the capital, and was practically carrying on the whole business, and where there was no imputation upon his solvency.

Mr. DAVEY said his clients would do so if his lordship thought it necessary, but practically there was nothing to receive.

The MASTER of the ROLLS said the statement of Mr. Ince was that the concession was a valuable and saleable thing now.

Mr. DAVEY said the plaintiff had been invited to introduce these persons to the defendants, but they were so exceedingly shy that they would not have their names mentioned.

Mr. INCE said he should much prefer a simple order for a receiver, and a reference to chambers, with liberty for either party to propose himself.

The MASTER of the ROLLS said he should give the plaintiff liberty to bring into chambers any proposal for a sale.

Mr. DAVEY said he need not take it into chambers; it would be quite sufficient if he would bring a substantial proposal to the defendants. Of course the proposal must come from some person whose name was given.

The MASTER of the ROLLS said the defendants could oppose it if it did not meet with their approval. The defendants would be appointed, as he had said, receivers, without salary or security.

THURSDAY, DEC. 5.

(*Before Vice-Chancellor* MALINS.)

GLOSSOP *v.* HESTON AND ISLEWORTH LOCAL BOARD.

This case again came before the Court to-day.

Mr. HIGGINS, Q.C., asked that the operation of the injunction granted against the defendants might be postponed for three months; saying that it was intended to appeal, and the appeal would be heard very shortly. The Board had done all they could, and hoped to satisfy Mr. Glossop.

The VICE-CHANCELLOR: Have you been doing anything?

Mr. HIGGINS: Yes, my lord; physically, morally, socially, and otherwise.

Mr. GLASSE, Q.C. (for the plaintiff): I will give them a fortnight.

The VICE-CHANCELLOR: Is Mr. Glossop living in his house?

Mr. GLASSE: He has been obliged to send his family away.

The VICE-CHANCELLOR: I think I had better suspend the injunction, pending the appeal.

Mr. GLASSE: It may not be heard before the hot weather, in June.

Mr. HIGGINS: If it were money, we could deposit it in Court; but we cannot do that with sewage.

The VICE-CHANCELLOR: That is so.

Mr. GLASSE: In the middle of last month they began a new drain.

Mr. HIGGINS: The costs of these applications are certainly a drain, though not a new drain, upon the resources of the Board.

The VICE-CHANCELLOR: When do you expect to finish it?

Mr. HIGGINS: The middle of next month.

The VICE-CHANCELLOR: I will suspend the operation of the injunction until the 1st of February.

SATURDAY, DEC. 7.

SIMMONDS *v.* VESTRY OF RICHMOND.

Mr. PEARSON, Q.C. (with him Mr. BRADFORD), who appeared for the plaintiff, said this was a summons, adjourned from chambers, to review the finding of the Chief Clerk, who had awarded a sum of £250 as damages sustained by the plaintiff through the erection by the Richmond Vestry of pumps and a steam-engine close to her house. The plaintiff was the proprietor of a boarding-house at Richmond, and her claim was for damages occasioned by damp from the engine, which spoilt her carpets and injured the paint and paper of the house, for injury done to the shrubs and plants in the garden, and for the loss occasioned by her boarders going elsewhere.

The VICE-CHANCELLOR inquired whether the artesian well had been completed.

Mr. GLASSE, Q.C. (with whom was Mr. GLEN), who appeared for the defendants, said that it had.

The VICE-CHANCELLOR: Is it being worked?

Mr. GLASSE: Yes, my lord.

The VICE-CHANCELLOR: Has Richmond plenty of water now?

Mr. GLASSE: Yes, my lord, and some to spare.

Mr. PEARSON: Before the engine was erected the plaintiff had a very thriving business, it being usual for as many as 24 persons to sit down to dinner each day.

Mr. GLASSE said she would now have the benefit of an advertisement by means of the suit.

Mr. PEARSON did not think such an advertisement would do any good.

The VICE-CHANCELLOR suggested that the defendants should increase the sum to £500.

Mr. GLASSE said he had no objection to give her the £250, and instead of asking that the bill should be dismissed with costs, he would say nothing about the costs of the suit.

The VICE-CHANCELLOR said that if she was entitled to £250 she was entitled to the costs of the suit.

Mr. GLASSE thought he should prove that she was not.

The VICE-CHANCELLOR said that perhaps the plaintiff had better take the £250 and the costs.

Mr. GLASSE could not consent to pay the costs prior to the reference to the Chief Clerk.

The VICE-CHANCELLOR said there was no doubt that the Vestry of Richmond had put the lady to a great deal of inconvenience, and they ought to make her some compensation. He thought that he had better hear the defendants upon the question of costs.

Mr. GLASSE submitted that up to the time of the reference to assess the damages, the plaintiff was not entitled to costs, though after that date he did not dispute that she was entitled to them. The plaintiff had no right to commence an action in the Chancery Division of the High Court of Justice, her remedy being to go to arbitration. As the damages would have to be assessed by the arbitrator, he did not object to pay the costs after the date of the reference to the Chief Clerk, putting him in the place of the arbitrator. The Act of Parliament gave urban and rural authorities power, in order to supply districts with water, to construct and maintain water-works, to dig wells, and do other necessary acts, and for any damage occasioned by them in so doing, they were to make full compensation, such compensation to be assessed by an arbitrator. Instead of going to arbitration, the plaintiff chose to bring an action in that Court.

The VICE-CHANCELLOR asked whether the defendants had offered to refer the matter to arbitration.

Mr. GLASSE said it was not for the defendants to offer arbitration—the plaintiff ought to have done that. To make an end of the suit, he was instructed by his clients to offer the plaintiff her costs, as between party and party, after the date of the reference, and up to that time the costs out of pocket.

Mr. PEARSON said he could not accept the offer.

Mr. GLASSE said that offer not being acceded to, he must go on with the case.

The VICE-CHANCELLOR said the better plan would be to confirm the Chief Clerk's certificate, and to let the costs of the summons be costs in the cause.

Mr. GLASSE said he should be willing to accede to that.

Mr. PEARSON had no objection to that course being taken.

The VICE-CHANCELLOR: Then the certificate will be confirmed, and the costs reserved. I hope the parties will settle the matter, and that I shall never hear anything further of it.

THURSDAY, DEC. 5.

(*Before Vice-Chancellor* BACON.)

ATTORNEY-GENERAL *v.* LEYTONSTONE LOCAL BOARD.

This case, previously reported in the JOURNAL, was again before the Court.

Sir H. JACKSON, Q.C., on behalf of the relator, moved for a sequestration upon the ground that there had been a deliberate breach of injunction. The information was filed in 1869, amended in 1870, and, on motion for injunction, the defendants, who were the Sewer Authority of the locality, undertook to execute certain works.

Mr. HEMMING, Q.C., interposing, asked that the motion might stand over upon the ground that, since the order was made by the Court, circumstances had entirely changed, by another large district draining into the Leytonstone sewers.

Sir H. JACKSON: In Dec., 1873, a perpetual injunction was granted, and not a single brick for the sewers has been laid.

Mr. HEMMING: An entirely new scheme is in contemplation, which will be better for both of us. I ask for a fortnight at all events, to get the report of a skilled engineer.

Sir H. JACKSON: I will limit you to a week, or nothing will be done.

After some further discussion, a week was allowed.

COMMON PLEAS DIVISION—FRIDAY, NOV. 29.

(*Before Justice* LINDLEY *and a Special Jury.*)

ELLIS *v.* THE LONDON GASLIGHT COMPANY.

Mr. MARSHALL GRIFFITH, Q.C., and Mr. COCK appeared for the plaintiff; Mr. STAVELEY HILL, Q.C., and Mr. MATTHEW for the defendants.

Mr. GRIFFITH, in stating the case to the Jury, said that the plaintiff, Mr. James Ellis, sought to recover compensation from the defendants, the London Gaslight Company, for a very serious injury he had sustained, owing to a gas explosion produced by the negligence of persons in the employ of the defendants. The plaintiff was a carman and contractor in a small way of business, residing in Pimlico, and he was employed, on the 19th of December last, by some persons who were decorating and restoring a house belonging to Lord Walsingham in Eaton Square, to remove some rubbish and other materials. The plaintiff on that date saw the foreman of the works, a man named Clarke, and asked where the rubbish and materials were which he had to remove. Clarke and the plaintiff went downstairs together into the area, and almost immediately after arriving there an explosion took place. Under the portico of the house there was a vault, consisting of two spaces or rooms, the outer one being used as a gas-meter room, and communicating with an inner space or room, used as a water-closet; a partition wall, not reaching to the roof, being between the two compartments. Upon Clarke and the plaintiff getting into the area, Clarke told the latter that he would show him the rubbish and other things he would have to remove, but asked him to wait for a short time in the area. Clarke went into the outer room, opened the door of the partition which separated it from the water-closet, and entered, the plaintiff remaining outside in the area. When the door of the vault was thus opened, the plaintiff observed that there were two persons—a man and a boy—engaged in doing something to the gas-meter. The service-pipes to the house had been connected with the main and brought into the house, but the meter had not been attached to them. The man and the boy were employed by the defendants to attach the meter to the service-pipes. When the door was opened the plaintiff saw the meter on the floor. The man was standing by it, with a gas-pipe in his hand, and the boy had a lighted reed and a blow-pipe, so that it might be presumed they were engaged in soldering or fastening the pipe of the meter to one of the service-pipes. Almost immediately after Clarke had gone into the water-closet, and while the plaintiff, in the area, was looking on, an explosion took place, which threw him at least 10 feet from the place where he was standing, burnt him very seriously indeed about the face and hands, and rendered him quite insensible. The question which would have to occupy their attention was whether the explosion was or was not caused by negligence on the part of the defendants servants. Without venturing to say how the explosion actually took place, he thought the very fact of it occurring would be sufficient to satisfy them that there must have been some negligence on the part of the persons who were engaged in attaching the service-pipes to the meter. He was told that

before the service-pipes were connected with the meter they had a plug fitted to them, to prevent the escape of gas into the house; and when the connection had been made with the house, and before the meter was attached, a notice was put up by the Company, distinctly pointing out that the cap or plug was not to be removed from the service-pipe, except by the Company's workmen, or by permission of the Company. It was the duty of the gas-fitters, in attaching the pipes to the meter, to remove the plug, but in that case to attach a cock by which the gas could be safely turned off. The defendants said that no more gas was escaping than would necessarily take place in connecting the meter with the pipe; but this must have been a misapprehension on the part of the defendants, because if the plug was withdrawn, the cock might be immediately attached, and the quantity of gas that would escape would not be sufficient to cause such an explosion as happened on the occasion in question. He would put it to them that the cause of the accident was this—that, when the plug was removed, the defendants servants so negligently attached the cock that a large escape of gas from the service-pipe took place, and accumulated in the vault; so that it was gross negligence to use any light of that description there, in the midst of so large a quantity of gas. He did not say that it might not be necessary to have some amount of light for soldering the pipes; but if so much gas had escaped from the service-pipe, it was the duty of the gas-fitter to open the door to allow the gas to disperse. It would also occur to them at once that, if a work of this kind was going on, and so large an amount of gas escaped, it was the duty of the defendants servants to point out to persons going into the vault, or into the closet, that it would be dangerous for them to open the door either of the outer vault or the closet, and so produce such a current of air as would cause the explosion. Clarke was allowed to pass the workmen to go into the water-closet, and the moment he opened the door the current of air produced had caused the reed in the boy's hand to ignite the accumulated gas, and thus cause the explosion. The defendants held that the plaintiff had no right to be in the vault—that there was nothing that made it necessary for him to be there. But the plaintiff, as a matter of fact, was not in the vault at all; he was standing in the area some 2 or 3 feet from the entrance to it. However, whether he was in the area, or had entered the vault, would make very little difference in this case, because the defendants were bound to take care that the escape of gas should be so small that, even if any person went without warning into the vault or closet, he would be able to do so in safety. He would call persons of experience in the gas-fitting business, who would state how these fittings ought to be attached, and they would satisfy them that this work of connecting gas-meters with service-pipes could be done without risk—that the amount of gas that would escape at the moment of the junction would be so small that no risk whatever would be incurred, and that on this occasion there must have been a great want of caution on the part of the Company's servants in removing the plug from the service-pipe, or attaching the cock to it, so that a quantity of gas escaped, which would produce such an explosion as had actually occurred. He thought they would be of opinion that there was such negligence on the part of the defendants servants as entitled the plaintiff to compensation for the injury he had sustained. As to the question of damages, the plaintiff was blown to a distance of some 10 feet from where he was standing, and was very much burnt about the face and hands. When the explosion occurred a great deal of smoke and flame issued into the street, and a policeman came to assist to take the plaintiff to the hospital. Clarke, too, was very much hurt, and was also taken to the hospital, and the Surgeon there would state that for some days the plaintiff's life was in danger, that he was in the hospital for five weeks, and that while there he was in intense pain, and was afterwards an out-patient for a considerable period. He should also call before them a medical gentleman who had been in the habit of attending the plaintiff's family for some years, and he would tell them that, although the plaintiff, who was 65 years of age, had not been permanently disabled by the accident, still he had since become a very much weaker man than he formerly was. He was nervous, tremulous, and his eyesight had become very much impaired. In addition to the injuries he sustained, he had incurred considerable pecuniary loss; and if the Jury came to the conclusion that the defendants were liable to make compensation to the plaintiff, he did not think his learned friend was likely to cavil much at the amount claimed for damages, which were set down altogether at £38 14s. The great question to be considered was whether, under the circumstances in which the accident took place, the defendants were or were not liable in consequence of the negligence of their servants, and he thought he should be able to satisfy them that the defendants were liable.

The following witnesses were then called on behalf of the plaintiff:—

Mr. *James Ellis*, examined by Mr. Cock.

I am the plaintiff in this action, and my business is that of carman and contractor. I am 65 years of age. Previous to, and at the time of the accident, I was in the employ of Mr. Clarke, who is very much engaged in the removal of works of art. On the 19th of December I was employed to remove some bagging and straw from the house of Lord Walsingham. The straw and the matting were in the vault under the steps going from the street to the front door. On the day in question I removed some stuff, and intended to remove the remainder. The straw had been removed into another vault. I went alone into the area. I knocked at the area door, and saw the housemaid, who told me that Mr. Clarke was upstairs. He then came down with me, and went into the vault; but I did not. The vault was divided into two parts, but the partition does not go to the roof. The inner part of the vault was a servants water-closet. That was the closet used by the workmen who were there. I stood about 3 feet or 4 feet from the outer door. I saw a man and a boy at work there, and stood watching. I noticed where the gas-main came in. It is about 1½ inches in diameter. Directly Clarke opened the inner door I was knocked down. I did not hear Clarke told by any of the men that it was dangerous to enter the vault. As a result of the accident I was very much injured, and my whiskers and hair were burnt. The boy was standing on a box, using the blow-pipe; but I never spoke to him. A policeman came after the accident, and took me to St. George's Hospital, where I remained for about five weeks, and was an out-patient for several weeks afterwards. I have never had the same health since the accident. I have been very much shaken, and my eyesight is impaired. I cannot do my work as I used to, and I have been obliged to employ men to do it. This has cost me over £20. All my clothes were destroyed. I estimate the value of them at about £4 10s. I had to be wrapped in cotton and oil, and after that I did not know anything for three or four days. I have had to employ cabs frequently, and have had to take extra food, the cost of which I should put at £10. Before the accident, I was a strong and hearty man, and never had a day's illness.

Cross-examined by Mr. S. Hill: There is no doubt my eyesight would get worse at my age. I had another accident about three months ago. It was caused by a horse falling. My knee was hurt, and I was in the hospital then for six weeks. I was at Lord Walsingham's house on portions of two days, fetching away straw and matting. I bought it from Mr. Clarke. I saw the matting before I went for it. Mr. Clarke showed it to me at dinner-time on the day in question. It was not lying in the meter vault or the water-closet vault; it was in another part of the area. [By the aid of a plan, the witness described the exact place where the matting was lying.] There was no necessity, as far as the matting was concerned, for my going into the part where the men were working. The time of the explosion was about ten minutes to one. Clarke and I went down about the same time. I heard him say something to the gas-fitter, but what it was I cannot tell. I saw Clarke open the door of the water-closet, and the explosion took place almost immediately afterwards. The men seemed to be making a joint.

Re-examined by Mr. Griffith: I saw Clarke open the door of the closet, then the explosion knocked me down, and I do not remember much afterwards. I was suffering from the effects of the gas accident up to the time I received the accident in September last, and I still suffer from it. I had on more than one occasion taken rubbish away from the house.

Mr. *William Clarke*, examined by Mr. Griffith.

I live at 111, Gloucester Grove, South Kensington, and am in my brother's employ. He is a painter and decorator. In December last year Ellis went by appointment with me to the house of Lord Walsingham, to remove some rubbish. I remember Ellis coming to the house on the day of the explosion. The bagging was in a vault in the area, and I went down with Ellis and showed him where it was. I went into the water-closet, and left Ellis standing outside. The closet is in the inner division of the vault. I had to pass the place in which the meter was to be fixed before I could get to the closet. I saw a man and a boy at work there. The boy was standing on a box, either making or disconnecting a joint with a blow-pipe; the man was holding the pipe, but I could not say whether it was the inlet or the outlet pipe. The meter was on the ground as I passed in. I said, "I suppose we shall have the gas on." The man said he could not put it on, as the pipe over the partition was not the right pipe, or something to that effect. I told him it would be ridiculous to leave it, as that must be the pipe, because it was unconnected with anything. Having made that remark, I passed into the water-closet. At the time of the explosion the inside door slammed to, and I found myself all on fire. I made my way out as well as I could. I told Ellis to wait outside the vault. Having got out of the closet, I passed through the gas-meter vault into the area, and saw a policeman taking Ellis up the steps. This was the only closet in the house that was in a condition to be used. A portion of the house had recently been rebuilt, and his lordship was having traps put to the closets. I have seen the meter, but have not examined it minutely.

Cross-examined by Mr. S. Hill: I should think I had been nearly a hundred times into the meter vault previous to the explosion, and I am well acquainted with the area. I had some conversation with the gas-fitter. I believe I said, "I suppose we shall have the gas on now." He told me he could not lay the gas on because he did not know which was the proper pipe. He showed me a pipe over the cistern in the water-closet. I looked at the pipe to see whether the man was right or wrong. I have no recollection of saying, "I can see where the pipe goes to." I cannot say what the men were doing with the rush-light. I intend to make a claim against the Company, whether the present action is successful or not.

Re-examined by Mr. Griffith: I should suppose the disconnected pipe in the closet was a gas-pipe. There was not any gas in that pipe, and never had been. The pipe in the water-closet is now used as a gas-pipe.

By the Jury: The inlet-pipe is in a rusty condition.

John Baily, P.C. 84 B, examined by Mr. Cock, said: I was on duty in Eaton Square on the 19th of December. I saw flames coming up from the area of the house, and the plaintiff at the front door with his face and hands all burnt. I took him to the hospital.

Mr. *T. Holmes*, F.R.C.S., examined by Mr. Cock, said: I am one of the visiting surgeons at St. George's Hospital. The plaintiff when admitted had his hands and face burnt, and was in a state of collapse. The injury was a very serious one, and his life was in considerable danger. I should think it very likely that the plaintiff will not be so able to do his work as formerly.

Cross-examined by Mr. S. Hill: I should say that when he left the hospital he was weak and tremulous, but otherwise convalescent.

Mr. *John Rees Webb*, M.R.C.S., examined by Mr. Cock, said that in the month of December he was acting as House Surgeon at St. George's Hospital. He described the condition of the plaintiff on the 19th of December last, and his evidence corroborated that given by the last witness.

Mrs. *E. Wiggington* said that she attended on the plaintiff while he was in the hospital, and he was in a weakly state for a long time after he left. He was an out-patient for some weeks.

Mr. *J. P. Scatliffe*, M.D., M.R.C.S., examined by Mr. Cock, said: I have known the plaintiff for some 17 years. Before the accident he was a strong man. After leaving the hospital I saw him, and he seemed to be suffering from nervous debility, and was very tremulous. I saw him in August, and did not see him again until he had had his other accident. He complained of his eyesight, and said that he could not read with the spectacles he used previous to the accident. Up to June, when I sent in my first bill, the expenses would be £4; but they would now amount to £10.

Cross-examined: I have attended plaintiff chiefly for slight illnesses; but it was members of his family that I principally attended.

Frederick Holloway, gas-fitter, said that there should be a cock fixed to the inlet-pipe, which would prevent so much gas escaping as would cause an accident.

Cross-examined: If the cap or plug were removed, of course there would be an escape of gas unless a cock were affixed.

Re-examined: In attaching a meter to a service-pipe, there would be no escape of gas if the main cock were fixed on. There might be a slight escape of gas in the removing of the cap and the fixing of the cock. After the meter is attached and the cock fixed there ought not to be any escape of gas whatever.

By Mr. S. Hill: I have examined the pipe, and found it to be a 1½-inch. The joints connected with the meter might have been made outside in the area, and in such case no rush-light would have been necessary.

Mr. *Joseph Margetson*, draughtsman, said that he had made the model exhibited to the Court, and it was correct to scale.

This concluded the evidence for the plaintiff.

Mr. S. Hill then proceeded to state the case for the defendants. He said it had been stated that the main questions to be considered were two—first, whether there was any negligence on the part of the Company—that was to say, if they had a public duty thrown upon them, had they negligently failed in any way in discharging that duty? If so, then they would be liable, unless it was also found that there was negligence on the part of the plaintiff; because, if there was negligence on his part, or on the part of Clarke, with whom he was associated—if the accident arose not simply in consequence of there being some escape of gas; but if it would not have occurred unless there had been negligence on the part of those for whom the London Gaslight Company were not responsible—then there must be a verdict for the defendants in this case. His learned friend, in the course of his address, had asked first of all whether, when the plug was re-

moved, the defendants servants so negligently attached the pipe that a considerable escape of gas took place, and had such a large quantity escaped as would constitute negligence on the part of the defendants servants? Again, he said there was negligence on the part of the defendants servants, in using a light at that time; there was negligence on the part of the Company's servants, in not keeping open a door through which the gas might have escaped; and, lastly, there was negligence on the part of the defendants, in not pointing out to the men who came downstairs that there was danger in going into the water-closet. Lord Walsingham was about to inhabit a house which for some time had been untenanted, and gas was being laid on where it seemed never before to have been laid on. It was necessary before fixing the meter to unscrew the nozzle. It was a 1¼-inch pipe, through which a very considerable quantity of gas would escape, and it appeared that there were no means of letting the gas into the pipe when the nozzle was off; but what the man had to do was to have the tap ready to put on, and as soon as he had unscrewed the nozzle, to screw on the tap. Of course, it might happen that where a pipe was old and rusty, the screw could not be adjusted at first, and in all probability he might have to unscrew the tap again. Under these circumstances there must have been a considerable escape of gas. With regard to his learned friend's first proposition—that in doing this kind of work there must have been some little escape of gas—this was not denied on the part of the plaintiff, nor on the part of the defendants. Then there would be no negligence. In reference to the second question—that there was negligence in using so large a light for the purpose of soldering the meter on to the connecting-pipe, one thing would occur to their minds. That a light must always be used for the purpose of soldering one pipe to another was undoubted; but the witness said that the soldering might be done outside the vault. He would show that, as far as the Company's servants were aware, no escape of gas was caused. Not one of the witnesses for the plaintiff said that there was the least smell of gas in the vault. He went and talked with the man, and there was nothing to indicate any escape of gas. The gas would go from the place where it was escaping into the higher part of the vault over the cistern, and if a man used a light in the vault for the purpose of soldering the pipes, there would be no negligence. In fact, the whole circumstances of the case showed that there was no negligence, because the gas-fitter was there safely doing the soldering until Clarke and Ellis came downstairs. The gas must have escaped long before Clarke and Ellis came downstairs, because it was not present to the smell at the spot where the men were working, and, being accustomed to gas, they would not have stopped there with a light if there had been the probability of any danger. The gas had escaped when the tap was being fixed on instead of the nozzle, and it had passed along and been bottled up, so to speak, in the recess above the cistern. His learned friend said that the negligence of the defendants consisted in not keeping open a door to allow the gas to pass away; but there was no escape which would lead them to think there was any danger. It was also contended that there was negligence in not warning the men before they went downstairs; but, of course, if the men at work did not know that there was an escape of gas, they could not tell Clarke and Ellis that there was one. In reference to the point that had been raised as to the contributory negligence of the defendants themselves, he would call attention to the fact that the plaintiff and Clarke voluntarily interfered with work that they were not called upon to do, and it was necessary for him to show, from the position of the two vaults, that in order to get the bagging, the plaintiff and Clarke would be obliged to enter the vault adjoining the closet; but it appeared, from the evidence, that there was no necessity for them to enter the place where the closet was. Ellis and Clarke both went downstairs, and a conversation took place between the gas-fitter and Clarke; and Clarke had stated that he went into the closet from curiosity, and was not asked by the gas-man to look at the pipe. He entered the closet in a hurried manner, and thus the opening of the door caused the disturbance of the air, which naturally disturbed the gas located above the cistern in the higher part of the vault, and caused it to come in contact with that which it ought not to have had access to. The men were working with a light, without noticing any smell of gas, and what escape there was must have occurred some minutes before; and if Clarke had not entered the vault and opened the door of the closet, in order to satisfy his curiosity, he contended there would not have been an explosion.

The following witnesses were then called for the defendants:—

Alfred Attwell, examined by Mr. S. Hill, said: I am a gas-fitter in the employment of the defendants, and have been constantly engaged in fixing meters. On the 19th of December last year my son and I went to Lord Walsingham's house about half-past twelve. We took the meter to the vault, and we found the service-pipe projecting into the vault from the wall, about 5 feet from the ground. There was a cap on the end of the pipe. The meter-pipe was a 1¼-inch size. I took the cap off and screwed on the tap. I do not suppose the operation took half a second. In that process a small quantity of gas would escape; but there was nothing then to indicate that any large escape of gas had taken place. After that I screwed on an elbow, and measured the pipe for the joint. Ten minutes elapsed before we had a light to enable us to solder the joint. We had been using the rush-light about three minutes before any one came into the vault. Clarke and Ellis then came in, and Clarke asked what we were doing, and I said we were fixing the gas-meter. He said, "I suppose we shall soon have the gas;" and I answered, "I don't know so much about that." I told him I did not know whether the other pipe over the cistern was a water or a gas pipe. There was a plumber's joint upon it, which we do not ordinarily use. Clarke said he would soon see where the pipe went to, and whether it was a gas or a water pipe. He passed my son, pulled the closet door open quickly, got on the seat, and looked over the cistern. After he opened the door the gas fired. A little had escaped when the joint was fixed. The effect of opening the door would be to force the gas out from the recess near the cistern. There was no explosion—only a flame. Clarke did not complain in any way at the time. On this occasion I followed the course I usually adopt in fixing meters.

Cross-examined by Mr. Griffith: My son is about 20, and is in court. He and I went together into the meter vault on the morning in question. When I put the cock on, the meter was standing on the shelf. It was about 20 minutes after the cock was screwed on that I expressed a doubt to Clarke about the other pipe. The meter was on the shelf when Clarke came, and not on the floor. When Clarke came in we had a light. Ellis stood close to the door of the vault. I think the whole of this might have been caused by the small escape of gas between taking off the cap and fixing the cock, and then by Clarke having opened the door, so that the gas came out in contact with our rush-light. The cock was properly screwed on, and is now in the same position as it was then.

Re-examined by Mr. S. Hill: If the tap were improperly screwed on, there would be a small escape of gas.

By Mr. Griffith: If the cock had not been properly turned off, there would have been an escape of gas; but I saw that it was properly turned off.

By the Jury: I did not smell any gas when I went to work on that morning.

Alfred Attwell, son of the previous witness, corroborated the evidence given by his father.

In answer to Mr. Griffith, witness said he was himself injured by the flare, and was about 17 days in the hospital in consequence.

Mr. *Thomas D. Tully*, examined by Mr. S. Hill, said: I am Superintendent to the London Gaslight Company, and have been connected with Gas Companies for 40 years. I did not visit Lord Walsingham's house in reference to this matter, but sent Attwell, who has been employed by me for about 28 years. The first thing to be done in fixing a meter is to unscrew the cap and fix on the cock. The course adopted and described by Attwell is the one generally pursued. The escape of gas in this instance would be something under a cubic foot. I am satisfied the gas escaped in no other way than in the interval between the screwing off of the nozzle and the screwing on of the tap. Attwell could not have done his work properly in the area, because there would have been a draught, and, perhaps, dampness, and the joints must be made as sound as the cock when it is screwed on. I consider the place where Attwell was working was quite a safe one in which to do it. Had he smelt any gas he would never have lighted his rush-light. I have never seen the vault; but, looking at the plans, I am of opinion that the gas would be driven, by the air coming in, to the highest point in the arch of the vault, and be forced behind the cistern. One part of gas and nine parts of air is the most explosive compound you can have. One foot of gas might be dammed up behind the cistern. If the water-closet door were opened, air would rush in and force the gas down to a lower level, so that it would mix with the air, and cause the explosion when it came in contact with the light.

Cross-examined by Mr. Griffith: One cubic foot of gas would produce an explosion if it were mixed with 431 cubic feet of air. There are degrees in explosions as well as in everything else. It was not an explosion, however—it was a flare.

Re-examined by Mr. S. Hill: I do not mean to say that the one foot of gas was mixed with the whole of the 431 cubic feet of air.

Mr. Frederick W. Hartley, examined by Mr. Matthews.

I am a gas engineer, and have had 30 years experience in that capacity. I am not in the employment of the defendant Company, but I examined the vault where the accident took place. I have heard the description of the way in which the plug was taken out and the cock screwed on. In such an operation an escape of gas is unavoidable. If there were an excessive escape of gas, it would be immediately known to an experienced workman. The work done by the Attwells is such as is always done in the place where the meter is situated. I think any gas escaping in the vault would probably be forced up above the cistern, and the effect of opening the water-closet door would be to drive down the gas, bring it into contact with the light, and thus cause the explosion. The proportion of gas mixed with air that would cause an explosion depends upon the quality of the gas itself; but I think the proportion is rather nearer 7 to 1 than 9 to 1.

This concluded the evidence for the defendants.

Mr. S. Hill briefly summed up the evidence, and in doing so said he should hold that the plaintiff had associated himself with the gas-fitters, and was not in the vault under any circumstances which would involve a duty towards him, or a care of him, on the part of the Company, or render them chargeable with any negligence towards him.

Justice Lindley said he would not stop the case; but he did not think the objection a good one, because the legal answer to it would be that the plaintiffs were bound to take reasonable care of all persons on the premises.

Mr. Griffith was proceeding to reply upon the whole case, when

The Foreman intimated that the jury would not trouble the learned counsel to reply, as they were all agreed for the plaintiff.

Justice Lindley said he must, however, notwithstanding this intimation, ask them to make up their minds whether this was an accident for which the defendants were not responsible, or whether there was negligence. That was the real question they had to consider. He did not mean to say that they were not right in finding a verdict for the plaintiff; but they must consider that the defendants, by their servants, were doing that which was a lawful thing, and, therefore, if it was a mere accident, without negligence on the part of their servants, however unfortunate the result might be to the plaintiff, he would not be entitled to recover. They must be satisfied that there was negligence on the part of the defendants servants.

The Foreman: We are perfectly agreed as to that.

Justice Lindley: Then I will take your verdict.

A verdict was then entered for the plaintiff—damages £200.

Mr. S. Hill asked for leave to move upon the point he had submitted to his lordship, as he thought there was a great deal to be said upon it.

Justice Lindley: If you suggest that there is anything requiring attention, of course I will give you an opportunity. It would be a motion before me. The difficulty is to fix the time. I am not impressed with your point, I may tell you candidly; but if you think there is anything in it, I will grant the application.

Mr. S. Hill: I think there is.

Justice Lindley: Then I had better postpone judgment until to-morrow week, and you can have the case on the paper then.

His lordship certified for a special jury.

Saturday, Dec. 7.

This case came on for further consideration to-day.

Mr. M'Leod, on the part of the defendants, said that the question then to be debated was whether the plaintiff, under the circumstances, was a person who could maintain an action for the negligence of the defendants servants. Mr. Clarke, who accompanied the plaintiff, had passed through one vault, where the defendants servants were at work, and the plaintiff stood in the area at the door of the outer vault, awaiting Clarke's return. The object of the plaintiff in being there was to remove some straw that was lying in the area, and he was awaiting Clarke's instructions as to how he was to remove it. The actual plaintiff, he contended, had no reason whatever for standing at the door of the vault where the explosion of gas took place, except that he was accompanying Clarke, who went into the water-closet for a purpose of his own. He would not contend that the plaintiff was unlawfully on the premises, in the sense that a thief would be; but he was there as a mere volunteer. In support of his view he cited the case of *Degg v. The Midland Railway* (1st Thurlstone and Norman, page 773). This was a case where the servants of the Railway Company were turning a truck on a turn-table, and a person, not in the employment of the defendants, volunteered to assist them, and whilst so engaged the defendants servants negligently propelled a steam-engine, and killed the man, and it was held that the defendants were not liable.

Justice Lindley: He was assisting the person who was guilty of the negligence.

Mr. M'Leod: Yes.

Justice Lindley: Does that case show that the man who was injured could not have sued the man who injured him?

Mr. M'Leod said he did not think it decided that point.

Justice LINDLEY said it could not have been so decided, because there was a duty on the part of the defendants to take care of the man who was killed.

Mr. M'LEOD said he did not think there was any inference to be drawn from it. In the case he alluded to, as in the present case, the injury was against the master for the negligence of the servant. The mere fact of the plaintiff being lawfully where he was did not entitle him to sue for negligence. He contended that the place was a private, and not a public one; that the plaintiff, although he might have been lawfully there, was not there in the pursuance of the course of his business; that it was not a rule of law that every person who was lawfully in a place was entitled to all care; and that the plaintiff was in no better position than if he were assisting the defendants servants.

Justice LINDLEY, without calling upon the opposite side to reply, said he had no doubt whatever that the action was maintainable by the plaintiff. The facts were shortly these. The plaintiff went to the house and got directions from Clarke to take some rubbish, and the plaintiff went to the door of the vault. The plaintiff was not in any way a fellow-servant of the gas-fitter, and was not interfering or doing anything, except waiting for Clarke at the door. There was no ground, therefore, for applying the case of *Degg v. The Midland Railway* to this case. The plaintiff was lawfully on the premises, and had a right to be waiting for Clarke. It appeared to him, under all the circumstances, that it was plainly the duty of the Gas Company to take care not to injure anybody who was lawfully on the premises for the purpose of getting them ready for occupation, and his judgment would, therefore, be for the plaintiff.

Mr. MURPHY: Including the costs of this application?

Justice LINDLEY: Yes.

LEICESTER BOROUGH POLICE COURT.—WEDNESDAY, DEC. 4.

(*Before Messrs.* S. VICCARS, T. M. EVANS, *and* W. ROWLETT.)

FRAUDULENT CONSUMPTION OF GAS.

Henry Flowers was charged with fraudulently consuming and abstracting gas, the property of the Corporation, on the previous day.

Mr. *Goldsmith*, chief inspector in the gas department, said the defendant was a consumer of gas at 46, Nichols Street. In consequence of his suspicions, he went to the defendant's house the day before, following the inspector. The defendant's wife tried to turn the inspector out of the house. He went in, and defendant stopped him at the top of the cellar steps. He pushed by defendant, went into the cellar, and found that the pipe had been disconnected from the meter, and the gas used for cooking purposes. He saw in the cellar a cooking-stove with a half-cooked joint on it, the stove being very warm. He asked defendant where he obtained the gas, and he said from the back kitchen, 30 or 40 feet away. On being asked to produce the pipe conveying the gas to the cellar, the defendant made no reply.

Mr. *Gilbert*, gas inspector, corroborated the last witness. He added that Mrs. Flowers did all she could to prevent him entering the cellar, and pushed him backwards in the passage. Defendant went into the cellar first, and moved something before he and Mr. Goldsmith could ascertain the exact state of affairs.

Mr. FOWLER, for defendant, denied that any attempt was made to oppose the entry of the officers. He submitted that when the gas entered the pipes in the house it became defendant's property, and he was entitled to use it as he pleased.

The MAGISTRATES inflicted a fine of £5 and costs, or two months imprisonment.

SHEFFIELD POLICE COURT.—TUESDAY, DEC. 3.

(*Before Mr.* WELBY, *the Stipendiary.*)

THE SUPPLY OF WATER IN CASES OF INSOLVENCY.

The Sheffield Water-Works Company appeared to answer two summonses for refusing to supply water.

The first case taken was one in which a Mr. W. Wilkinson, of Gibraltar Street, Sheffield, summoned the Company for neglecting and refusing to supply water to a house in Kaye Place, Barber Road, of which he was the owner, after the legal rate had been tendered.

Mr. CLEGG appeared in support of the summons; and Mr. BARKER (instructed by Mr. BLAKELOCK SMITH) for the Company.

Mr. CLEGG, in opening the case, said it appeared that a Mr. David Kaye was the owner of 12, Kaye Place, Barber Road, and that about the middle of this year he found himself in difficulties. A water-rate was due on the 25th of June, but he did not pay it, and on the 6th of August he filed his petition in bankruptcy. On the following day, the Company gave him notice to pay the arrears of rent, and threatened, if he did not pay, to cut off the supply. On the 10th of that month a Mr. Pearson, who had been appointed receiver under the liquidation, and was also the representative of the mortgagees, wrote to the Company asking them to continue the supply to Kaye, and to charge the amount to him (Mr. Pearson). No reply was received, and on the 14th Mr. Pearson consulted his solicitors, who wrote to Mr. Ashton, the Manager of the Water Company. They told him that if the Company cut off the water they would be held responsible for any loss which might be sustained by the mortgagees or the tenants. An answer was received from Mr. Blakelock Smith, the Clerk to the Company, who claimed that the amount of arrears should be paid by the mortgagees if the water were not cut off. That he (Mr. Clegg) contended was really attempting to make the mortgagees responsible for the debts of Kaye. The facts were that the mortgagees, the Alliance Permanent Building Society, by their agreement allowed the debtor to remain in possession until he was three months in arrear in his contributions. After his liquidation they took possession, and continued to hold possession until the 6th of November, when they sold to Mr. Wilkinson, the complainant. He gave notice to the Company that he had completed the purchase of the property, and, tendering three months rent, asked them to re-connect the supply. That was the first time Mr. Wilkinson came into the matter; but he received a communication from the Company, stating that he was held responsible for the arrears, and that the re-connection would not be made until the arrears were paid. Mr. Wilkinson contended that he had nothing whatever to do with the arrears, and sought to compel the Company to supply him with water.

Mr. BARKER said that the question was one of principle. The Company wished to know their rights, and looked upon this as a test case. He pointed out that the mortgagees sought, by their agreement with Kaye, to protect themselves; in fact, there was a paragraph in the agreement which entitled them to take possession in the event of proceedings in liquidation being begun. On the other hand, the Company were empowered by the Water-Works Clauses Act to collect their rates in advance, but this power they had not used. In addition, however, they could recover rates not only against the owner or occupier, but against the premises. In this case they were unable to recover from the occupier because the house was under £10 a year rent, and against the owner because he was insolvent. So they proceeded against the premises, and contended that, in selling the house, the mortgagees had sold what was not theirs, inasmuch as it had a rate-charge upon it.

Mr. CLEGG denied that any Act of Parliament gave the Company power to proceed against the premises, and pointed out the injustice to Mr. Wilkinson. He contended that the Company could only recover from the person by whom the money was owing, and said the point had been decided before at the instance of Gas Companies, who were under similar Acts of Parliament.

The second case was a similar summons by Mr. C. Corbidge, jun., against the Company, in respect of 92, Division Street.

Mr. BINNEY appeared for the complainant; and Mr. BARKER again represented the Company.

Mr. BINNEY said the acts were that, on the 23rd of October, a Mr. George Biggs filed his petition in liquidation, and Mr. Corbidge was appointed trustee. A dividend was declared, and their proportion was offered to the Company, who declined to accept it, and cut off the water. He contended that the Company had no rights beyond those of other creditors.

Mr. BARKER said that in this case he had a stronger defence than in the last. He maintained that Mr. Corbidge took the debtor's property subject to all burdens attaching to it, and was really in the same position as Biggs would have been had he now been in possession. He quoted two cases in support of his contention, and said the law on that point was so old that he should have thought it would have been admitted.

Mr. BINNEY said that Mr. Corbidge was a perfectly independent tenant, just as much as any other person unconnected with Biggs would have been, and that the Company had no claim upon him for Biggs's debt.

The STIPENDIARY reserved his decision in both cases.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

Dr. Whitmore's report on the illuminating power, pressure, and quality of the coal gas consumed in the parish of Marylebone during October, and supplied by The Gaslight and Coke Company:—

October.	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quanty. of Sulphur in 100 Cu. Ft.	Mean Quanty. of Ammon. in 100 Cu. Ft.	Sulphuretted Hydrogn.
	*Mean of 25 Obser.	Highest.	Lowest.	Highest.	Lowest.	Grains.	Grains.	
Gas supplied from the Fulham works . .	17·00	17·54	16·41	19·68	11·60	15·00	0·46	No trace
Gas supplied from the Beckton and Bow works	17·18	17·54	16·46	33·78	18·33	12·66	0·60	No trace
Cannel gas supplied from the Pimlico works	20·92	21·00	20·13	32·62	13·98	13·17	0·60	No trace

Mean of daily readings of barometer . . . 29·62
" " " thermometer . . . 63·84

*Each observation consists of ten readings of the photometer, at intervals of one minute.

During the month of October the mean illuminating power of the three gases consumed in the parish was about one candle in excess of the legal standard, and on no single occasion did either of them fall so low as the standard; the Fulham and Beckton gas being never less than about 16½ candles, whilst on seventeen occasions they exceeded 17 candles. The mean quantity of sulphur found in 100 cubic feet of the Fulham gas was 15 grains, in the Beckton gas it was 12½ grains, and in the cannel gas rather over 13 grains. The mean quantity of ammonia in each was about half a grain. The pressure of the Fulham gas was occasionally low; in the other gases it was very good. On no occasion was sulphuretted hydrogen detected in either of them by the ordinary tests.

METROPOLIS WATER SUPPLY.

Dr. Whitmore's report on the composition of the Thames Companies and other waters supplied to Marylebone during October:—

October.	In Grains, per Gallon.			In Parts, per Million.		In Degrees.	
	Total Solid Matter.	Loss by Incineration.*	Chlorine.	Free Ammonia.	Albuminoid Ammonia.	Hardness.	Hardness after boiling Fifteen Minutes.
West Middlesex	19·00	0·90	1·04	0·01	0·08	12·8	2·8
Grand Junction	18·94	0·92	1·02	0·02	0·09	12·6	2·7

* The loss by incineration represents the amount of organic and other volatile matters contained in the Imperial gallon (70,000 grains) of water. The total solid matter, *minus* such loss, consisted chiefly of carbonate of lime, with small quantities of other equally harmless salts.

The water of both Companies was bright and clear. As compared with the two previous months, there was a very trifling increase in the amount of organic ammonia.

The following are the returns of the Society of Medical Officers of Health on the Composition and Quality of the Metropolitan Waters in November:—

Names of Water Companies.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen, — As Nitrates, &c.	Ammonia.		Hardness (Clark's Scale).	
				Saline.	Organic.	Before Boiling.	After Boiling.
Thames Water Companies.	Grs.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	21·90	0·061	0·195	0·000	0·011	14·8	3·3
West Middlesex	21·00	0·057	0·150	0·000	0·010	13·2	4·6
Southwark and Vauxhall . .	19·90	0·073	0·135	0·000	0·007	14·8	4·2
Chelsea	19·00	0·007	0·165	0·000	0·009	14·8	2·8
Lambeth	22·00	0·069	0·150	0·000	0·010	14·3	3·7
Other Companies.							
Kent	29·40	0·003	0·450	0·000	0·001	18·2	5·1
New River	20·40	0·017	0·180	0·000	0·005	13·7	2·8
East London	21·50	0·034	0·105	0·000	0·007	13·7	4·2

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours.

The water was found to be clear and nearly colourless in all cases but the following, when it was slightly turbid—namely, Grand Junction and West Middlesex Companies.

C. MEYMOTT TIDY, M.B., &c.

METROPOLITAN BOARD OF WORKS.

The usual Weekly Meeting of the Board was held last Friday—Sir J. M. HOGG in the chair—when the Parliamentary Committee submitted the Bill they had prepared for the purchase of the undertakings of the Metro-

politan Water Companies, and recommended that the Bill be approved with a view to its deposit on or before the 17th inst., and that the seal of the Board be affixed to the petition for leave to introduce the same into Parliament.

Mr. Le Breton proposed the adoption of the report.

Mr. Reddish moved as an amendment—"That the business of the Board requires so much time and consideration as to render it undesirable that anything should be at present done to obtain the transfer of the interests of the Metropolitan Water Companies; and that as the costs of the former application to Parliament for such transfer are not at present known, that as great complaints have been made of that expenditure, and as there is no evidence of the desire of the ratepayers for any further action in the matter, the proposed Bill be not deposited."

Mr. Leslie seconded the amendment, which, after discussion, was negatived by 20 votes to 13.

On the motion of Mr. Freeman, the consideration of the question was then adjourned for a week, and the Board proceeded to other business.

PORTISHEAD DISTRICT WATER-WORKS COMPANY.

The Half-Yearly Meeting of this Company was held on Saturday, the 30th ult.—Mr. F. Weatherly in the chair.

The Secretary (Mr. J. F. R. Daniel) read the notice convening the meeting, and the following report:—

Your Directors have the pleasure of reporting that the progress and prospects of your undertaking continue to be in every respect satisfactory.

The purchase of the Woodhill Water-Works property, with all the special rights connected therewith, has been completed on equitable terms, and your Company is now in possession of the property and rights, and in receipt of the rents.

Further share capital having been subscribed to an extent which appeared to your Directors sufficient to justify them in proceeding with the extension of the mains to Pill and St. George's, that work has been put into the hands of the Contractors, and is now making rapid progress, adding what they believe will be another profitable district to those previously supplied.

In the ensuing year the opening of the new docks at Portishead, and the coming into operation of the new sanitary statute with regard to the water supply of dwelling-houses, must add materially to the revenues of your undertaking.

Pursuant to the accounts now presented to you, your Directors recommend the declaration of a dividend of 30s. per cent. for the half year, being at the rate of £3 per cent. per annum.

The Chairman, in moving the adoption of the report and accounts, said although they were satisfactory, he thought it as well to make a few observations. In the first place, he considered he might safely congratulate the Shareholders on the completion of the purchase of the Woodhill Water-Works. This purchase had been made under the award of an arbitrator appointed by the Mayor of Bristol, and with the assistance of two eminent surveyors; and, he might say, would add a large per centage on the purchase-money to the revenue of the Company. The completion of the branch main from Portbury to Pill would add, they might fairly assume, another considerable per centage on the cost of that branch. With regard to the principal portion of the works for the supply of Portishead, they were gradually progressing with the laying of services, and they might conclude that, as the new Sanitary Act would soon come into operation, a further development of the property of the Company would take place. The Legislature promoted the development of Water Companies as necessary safeguards of the health of the population, and likewise exercised a wise compulsion on the part of Water Companies to supply hydrants for protection against fire. Now, although the Legislature had made compulsory the provision of means for the protection of life and property against fire, and to prevent the deterioration of the health of the public, yet the local body which was entrusted with the power of watching the carrying out of these means had not, up to the present time, moved one step in that direction, and, therefore, that body must not complain if the Company took action in the matter, and demanded payment for the requirements of the Act of Parliament, and so added to their legitimate revenue from that source. The prospect of the completion of the docks would add, in an important degree, to the income of the Company, and he might say these works were one of the chief sources of revenue as inducing the formation of the Company. He considered that, taking all these matters into their attentive consideration, they might safely regard the prospects of the Company as most encouraging.

The motion was seconded by Mr. Roberts, and carried unanimously.

The Chairman then moved, and Mr. Hall seconded, that a dividend at the rate of 3 per cent. per annum be declared, which was carried.

A vote of thanks to the Chairman concluded the meeting.

MANCHESTER CORPORATION GAS SUPPLY.

The usual Monthly Meeting of the Manchester City Council was held on Wednesday last—the Mayor (Alderman Grundy) in the chair—when the Gas Committee reported that they had determined to enter into a ten years contract for the sale of the ammoniacal liquor produced at the gas-works.

Mr. Hilton called attention to the manner of disposing of this product at the gas-works in London and Paris, and urged that the Committee should themselves manufacture it into chemicals. He said that by selling the liquor as was proposed, they would incur a great loss, and that, within the last ten years, Manchester had lost not less than £500,000 through selling the residual products from the manufacture of gas at less than the market price. They only received half the sum for them that was obtained by the London Gas Companies. To the objection which had been raised as to the Corporation becoming manufacturers, he pointed out that already they were manufacturers on a large scale, and said that a member of the Corporation would be shirking his duty if he declined to take any step which would be of advantage to the city. They need never be afraid of the electric light if they only made proper use of the gas products. If those products advanced in price as they had done, they would find that the residuals would become the principal profit; that the gas itself would ultimately become the residual; and that they would be enabled to say to the gas consumers of Manchester, "Now, gentlemen, burn as much as you like, we will make you a present of it." He moved as an amendment—"That the proceedings of the Gas Committee be approved, with the exception of the resolution relating to Harvey's tender for ammonia water, and that the same be referred back to the Committee."

Alderman Heywood seconded the amendment.

Mr. Harwood said that Mr. Hilton had put it into the power of the person who should make this contract with the Gas Committee to go into the market, and, on the figures which had been submitted to the Council, float a Company for the utilization of the ammonia water, and so make a handsome profit. The public should be warned of this possibility, because he altogether disputed Mr. Hilton's figures. The Committee had visited several places for the purpose of ascertaining the mode of dealing with the gas products, as to the future value of which no man could speculate. They advertised for tenders relating to the disposal of the ammonia water for ten years, and tenders were sent in by 17 firms. The tender accepted was based upon the most equitable principles that could have been conceived—so much per 100 gallons of ammonia water which would produce a certain weight of sulphate of ammonia. If the price went up, the Gas Committee would obtain an equivalent advance for the ammonia water, and if the value went down—which might be utter ruination to the man who had the contract, and utter confusion to the persons letting it—then the value of the water would go down with the decreased value of the sulphate of ammonia. He asked whether it would be wise, under the circumstances, to add to the already enormous responsibilities of the Gas Committee.

Alderman Lamb, Chairman of the Gas Committee, said the Committee were at present fully occupied with the difficult duty of supplying gas. Last w ek they provided as much as 12,675,000 cubic feet, and if they had been a le to give a full supply, he believed the weekly production would have r en to 15 million cubic feet. With reference to the objections of Mr. l ilton, he would only say that the Committee agreed to take the best c fer they had for the liquor, which was more than double the price they ver obtained before.

On a division, two members only voted for the amendment. The proceedings of the Committee were accordingly confirmed.

THE RECENT EXTENSIONS AT THE EASTBOURNE GAS-WORKS.

Last Thursday afternoon, the ceremony of laying a stone to commemorate the late extension of the gas-works took place. The stone is placed above the windows on the front of the governor-house, and bears an inscription on its face, to the effect that the works were erected in 1868 and were extended in 1878. Then follow the names of the Chairman (Dr. Jeffery), and Directors—Messrs. T. Arkcoll, B. Bradford, R. Colgate, J. Gorringe, W. Guy, R. Insoll, G. Lenny, and C. Simmons; of the Secretary, Mr. J. H. C. Coles; the Engineer, Mr. Alfred Williams; the Manager, Mr. Isaac Winchester; and the Contractors, Messrs. J. Aird and Sons. A lofty scaffolding, the steps of which were covered with crimson cloth, gave approach to the stone, which was laid by the Chairman of the Company, Dr. Jeffery, who was presented with a silver trowel and an ivory mallet.

The extension commemorated includes the laying of additional mains of an important character; the erection of a new retort-house—105 retorts are set, and there is room for some 60 more; condenser; scrubber, 80 feet high by 10 feet diameter; exhauster; steam coal-lift, and coal-tramway through coal stores; two purifiers, 24 feet square; purifying house; oxide shed; gasholder 100 feet in diameter, and holding 188,000 cubic feet of gas; apparatus for the manufacture of sulphate of ammonia; and a general enlargement of mains on the works. The old plant has been thoroughly overhauled and put in proper working order. The new governor-house, which holds the commemorating stone, contains two new governors, one for the old main, the 12-inch, laid in 1868, and the other for the new 18-inch main laid down this year. The whole plant is capable of supplying three times the quantity of gas that has been required as yet, the extension having been so planned as to provide for an anticipated largely increased consumption in the near future.

At the conclusion of the ceremony, the party descended and were grouped and photographed before commencing an inspection of the works. The different buildings and other erections were afterwards visited, and general admiration and satisfaction were expressed.

After the inspection, a champagne luncheon was served in the Manager's house.

BIRMINGHAM CORPORATION WATER SUPPLY.

The Birmingham Town Council held a meeting last Tuesday—the Mayor (Alderman Collins) in the chair—when the Water Committee reported their proceedings in connection with the proposed application to Parliament next session, to extend the time limited by the Birmingham Water-Works Act, 1870, for the construction of the works authorized by the Act, for the further period of five years; and to empower the Mayor, Aldermen, and Burgesses to borrow a further sum of £300,000 for the purposes of the Birmingham (Corporation) Water Act, 1875, and the undertaking transferred to and vested in the Corporation; and for other purposes.

The Council having gone into Committee to consider the provisions of the Bill,

Alderman Avery moved the approval of the preamble of the Bill.

This was agreed to, and the first six clauses were also approved.

On the motion to approve clause 7, providing for the re-borrowing of the old debt of the water-works undertaking,

Mr. Davis inquired whether it would be in the power of the Water Committee to borrow without coming to the Council for their consent.

Alderman Avery said the Water Committee would not be able to borrow any additional money for the purposes of the works. The borrowing powers were entirely vested in the Council.

Alderman Biggs suggested that a clause should be inserted in the Bill, giving the securities of the Birmingham Corporation the same privileges as the securities of the Metropolitan Board of Works, which held the same position as Consols, and might be taken up by trustees and others empowered to invest money in trust. At the present moment neither the gas annuities nor the water annuities, nor corporation securities of any kind, were legal investments for trustees. It might be said that this was an Imperial question, and could only be dealt with by special legislation, but he thought that unless, it was ventilated, Provincial Corporations would never have the privileges enjoyed by the Metropolitan Board of Works.

Alderman Avery thought it was extremely unlikely that the Legislature would agree to such an important enactment in a Private Bill. It would provoke considerable controversy, and would make it a fighting Bill instead of a pacific one.

Mr. Matthews said he knew that Earl Redesdale had refused to allow such a clause in a Private Bill like the one under consideration, on the ground that it would impose on him the necessity of investigating the financial capacity of the local bodies seeking the power.

Alderman Biggs said his only object was to have the matter brought before Parliament. He was convinced that it would make a great difference in the value of their stock, and he thought there was no hope of a general measure being brought in by the Government unless pressure was exercised by the local bodies interested.

The other clauses were considered, and agreed to.

The Bill, as submitted, was then approved, and power was given to the Water Committee to take all necessary measures to secure its sanction by Parliament.

The Price of Gas at Birmingham.—Mr. Beard gave notice that at the meeting of the Birmingham Town Council that was held last Tuesday he would refer to the increased national expenditure, the increased Municipal income from rates and local demands, and the high price charged for gas; also to the paralyzed unprofitable condition of trade; and would thereon move an instruction to the Gas Committee to reduce the price of gas from the 1st of October next, according to the following scale:—Under 25,000 feet, 2s. 9d. per 1000; under 100,000 feet, 2s. 7d. per 1000; and over 100,000 feet, 2s. 5d. per 1000 feet. The Council, however, adjourned before this motion could be discussed.

EXPERIMENTS WITH THE ELECTRIC LIGHT AT WESTGATE-ON-SEA.

With the view to assist in determining whether the electric light is applicable to public street lighting, and to ascertain its cost in comparison with gas in this country, Mr. W. A. Valon, the Engineer of the Ramsgate Gas and Water Works, arranged with Mr. W. H. Bennett, the Secretary of the British Association of Gas Managers, to give, for four hours each evening this month, an exhibition of six electric lights on the Jablochkoff candle principle.

The first experiment was made on the evening of Monday, the 2nd inst., the lamps being arranged along the sea-wall; and on that occasion Mr. Edmund F. Davis, the proprietor of the Westgate Gas and Water Works, conveyed from town a select party of personal friends, together with several scientific gentlemen and representatives of the London Press.

The apparatus consists of a 10-horse nominal power engine, driving a pair of Gramme's dynamo-electric machines. The smaller machine was travelling at the rate of 1250 revolutions per minute, and the larger machine at about 1000 revolutions, the former being used to excite the larger machine. By this process the magnets become electro-magnets, and the revolving drum alternates the current about 50 times in a second. The lamps are placed about 80 yards apart, and are connected to the machine by two circuits of cable, lighting three lamps in a circuit.

After the examination of the lights, the party adjourned to the Beach House Hotel, where dinner was provided, at which about thirty sat down. At the conclusion of the repast,

The Chairman said that having met together for the purpose of general information respecting public illumination, and seeing so many eminent men around him fully conversant with the subject, he would suggest that no set speeches should be made, but that the discussion should take a conversational turn. He had much pleasure in calling on Mr. W. A. Valon to lead the conversation and open the question before them.

Mr. Valon: Gentlemen, our object is to judge the merits of the electric light, and, thanks to the liberality of Mr. Davis, we are to have a prolonged exhibition of it, so that the public generally, as well as all who are particularly interested in it, may have a fair opportunity of comparing it with the ordinary mode of illumination by gas, and of arriving at a fair, honest comparison, both as regards its adaptability and cost. We have all seen the light, and certainly, as far as appearance goes, no one can deny its beauty; but there are necessarily other things beyond appearance which must be taken into our consideration in estimating its value. It is this object Mr. Davis has in view, and to determine it he has expended a large sum of money. I can assure you, gentlemen, that it is the firm intention of all those who are employed to conduct these experiments that everything shall be done with perfect fairness, that the results shall be as reliable as it is possible to make them, and that any challenge given by promoters of companies or by inventors as to their correctness shall be met with indisputable facts, supporting them or disagreeing with them as the case may be. This is the more necessary seeing that up to the present time we have been entirely dependent upon figures furnished by electric companies or sanguine inventors, which, while they may be true, must be confirmed by individual statements from reliable and undeniable data, else we shall be slow to believe. And here I would remark that it must not be thought, as I have been told more than once, that because we are gas men, we are so full of hostility to the electric light that we will not admit the truth even if convinced. Nothing of the sort. Who so much interested as we? And if this new light is to be the light of the future, who so likely as the present purveyors of light to be first in the field, and to assist in its development? None. My own opinion is that the electric light may have a great future before it, but that future will not interfere with the consumption of gas, or to a very small extent, if at all. I grant you the light may show us some of our imperfections, and may set us thinking; but I believe we can overcome these defects; whatever they are, there is elasticity enough in gas to rise to the occasion. When gas lighting was first introduced into this country, we had to encounter the usual croakers, who discerned the ruin of all candle and lamp makers. Has it ruined them? No. On the contrary, it set the candle and lamp manufacturers thinking, and consequently led to the production of superior articles. When railroads first started, we were gravely told that that useful animal, the horse, would become a thing of the past for purposes of draught, and our grandchildren—viz., the children of the present generation—would be taken to the British Museum to gaze with wonder at a stuffed animal, and be told that that was a horse of ancient days. But what of to-day? There are more horses, and they now cost more money than ever they did. The same may be said of underground railways, tramways, and innovations of all kinds; but still we therein find room enough for all, and so I believe electricity, as a lighting agent, will find its own groove and run in it. Proprietors of gas undertakings, therefore, have nothing to fear. I had intended to say something of the comparative cost of electricity and gas, as far as I understand it at the present moment; but this I may say broadly, that everything in this country is tested by its commercial value, and the electric light must come to that standard, putting aside its at present undeveloped condition, its liability to derangement and extinction—a serious thing in a crowded thoroughfare, the utter impossibility of storeage, the difficulties of distribution, which make it compulsory to manufacture it as it is required, either to use or waste, the difficulty of adjusting carbons from day to day, which reduces it at present to a better kind of lamp, its want of diffusion, which defect is only partially remedied by the use of opal globes, which destroy the light to a great extent. But these difficulties being overcome, as I have already stated, it must be tested by its commercial value, and it becomes a question whether it is cheaper to consume hydrocarbon gas direct, as distilled from coal in a retort, or destroy so much hydrocarbon to produce the same amount of light in the form of electricity. But, gentlemen, allow me to repeat that whatever the results of the present experiments are, they shall be faithfully recorded. It is only necessary for me to add that Mr. W. H. Bennett has been associated with me to determine these results—a gentleman whose decision, I am sure, will be implicitly relied on by the whole of the gas world, and whose official connection with the British Association of Gas Managers is a sufficient guarantee that the various experiments and comparisons will be conducted with accuracy and fairness. During the last twelve months I have watched closely, and with great interest, the rapid strides of electric lighting into public favour, and have examined minutely the different modes of its production. For many years, when a younger man, I gave electricity, as a lighting agent, much attentive consideration and study, believing (from want of experience) that it might some day interfere very materially with the consumption of gas; but, convinced as I am that the promoters of the electric light can never interfere, or favourably compete with the supplies of gas, I am prepared to do all in my power to assist in its development and introduction, and to help those who seek to promote its adoption in its own sphere.

The Chairman said he should like to hear some remarks from Mr. Bennett.

Mr. Bennett: I feel much flattered by the request, seeing that Mr. Valon has touched almost, if not all the points that can be dilated upon at this moment. I am most anxious that those present should not run away with the erroneous impression that because these experiments are to be conducted by gas men, any results favourable to the electric light will be ignored. I am quite aware of the French proverb, *qui s'excuse s'accuse*; but it has been openly stated in some quarters that the merits of this light are not likely to be fully exhibited by them, hence these remarks. I can assure you, however, that my intention is to give the whole of the facts attending the experiments, so that, while I shall publish my own conclusions, everybody else will be able to draw his own inferences for himself What Mr. Valon has said is quite true. Hitherto we have had to receive the figures of those who are either inventors, or the promoters of Companies for working those inventions, and as there are manifest fallacies in the figures put forth, it becomes the duty of the present experimentalists to point out the errors into which the too sanguine promoters of the electric light have unfortunately fallen. I cordially endorse all that has been said by Mr. Valon, and hope, if similarly called upon in a month's time, to be able to give more interesting answers to the questions that may be put to me than I can now.

Mr. Williams: I should like to ask how many lights can be obtained from one circuit, and how far that circuit might extend.

Mr. Gripper: The number of lights on one circuit, and the distance that the current could be sent, depend entirely on the power of the machine. In the present instance the lights are farther apart than I ever recollect them before being placed.

Mr. Williams: But the lights in the Avenue de l'Opéra are more numerous and more extended.

Mr. Gripper: Yes; but there are several machines to supply them.

Mr. Davis: The gas we are now burning in this room comes from Birchington, a distance of 1¼ miles. Would it be possible for me, if I wished to do so, to send electricity from here to Birchington to give light there?

Mr. Gripper: It would be possible, but not economical.

Mr. Davis: Then how am I to light Birchington?

Mr. Gripper: I should say, decidedly, take your machines to Birchington.

Mr. Davis: What am I to do for light along the road between here and Birchington?

Mr. Gripper: Place machines at convenient distances.

Mr. Davis: Then you mean to say, instead of delivering at one station as I now do with gas, in the case of electricity I must have several machines and several engines—in other words, several stations—in such a short distance as there is between here and Birchington?

Mr. Gripper: Yes; that is, I do not say Birchington could not be lighted from here by one machine driven by sufficient power, but it would be expensive.

Mr. Davis: But supposing it practicable to send a current from one machine the distance in question, what would be the power of the engine necessary to drive the machine, supposing the lamps to be the same distance apart as those at present fixed?

Mr. Gripper: I am afraid to say, but it would be very great.

The Chairman called upon Mr. Wrightson for some remarks.

Mr. Wrightson: I have listened with great pleasure to the remarks of the Engineer and other gentlemen on this question. I have had occasion to use the electric light myself while executing, for the Government in India, works in which we were pressed for time, and I could think of no other mode by which they could be continued at night as well as by day, and by its aid we were enabled to continue the operations without serious interruption, excepting what occurred from the uncertain character of the light itself. The immediate drawbacks to its use occurred to me in the intensity of the shadows thrown, and the difficulty of arranging the reflectors to destroy those shadows; still I found it very useful for our purpose. I am of opinion, as Mr. Valon said, that electricity is not destined to interfere with the consumption of gas, and it is for such works as I have described, and for open spaces, and for such positions in which gas cannot be utilized, that the light will be brought into use.

The Chairman said that he should like to hear the Rev. E. G. Banks make a few remarks.

Mr. Banks: I have very little to say. I have seen the light, and am satisfied that, though a very beautiful light, gas has nothing to fear in competition with it. In fact, I cannot believe that there ever will be any serious competition between electricity and gas. I am not one of those who have been intimidated by what was commonly known as the gas scare; on the contrary, I have endeavoured to purchase shares at the present depreciated prices, but have found it impossible, which shows that gas shareholders were no more frightened than myself. Some people have twitted us with having bought a "white elephant" by the purchase of the Ramsgate Gas-Works, and tell us that we shall not know what to do with them when the electric light comes into use; but I am perfectly satisfied with our bargain, and am certain that electricity will never interfere with it.

Dr. Hamilton: I think, as far as street lighting is concerned, it may interfere with gas companies.

Mr. Valon: And a very good thing too. As far as street lighting is concerned, it is more plague than profit, and gas companies will be very glad to hand it over to the electric light people.

Mr. Bennett: The consumption of gas for public lighting does not, as a rule, exceed in a year one-tenth of the manufacture. The consumption increases at the rate of 10 per cent. per annum; therefore, if the contract for public lighting were transferred to the electric companies, it simply means that the gas companies would be one year without increase, but would lose nothing by the transaction.

After some further remarks, the discussion was brought to a close.

As soon as Mr. Bennett's report on the matter is published, we shall be pleased to give it in the Journal.

THE CITY OF PARIS AND THE ELECTRIC LIGHT.

Commenting upon the proceedings at the sitting of the Municipal Council of Paris on the 7th ult., to which reference was made in the last number of the Journal (p. 824), on which occasion authority was given for the continuation of the experiments with the electric light up till the 30th of November, with the object, among other things, of enabling the exact illuminating power of a single lamp to be definitely ascertained—for which purpose a sum of 2000 frs. (£80) was voted to defray the expense of fitting up suitable photometers—our contemporary *Le Journal des Usines à Gaz* remarks:

"Not only do we admit the right of the Municipal Council to authorize trials of the electric light in the public thoroughfares, but we even assert that it is their duty to encourage progress in lighting in whatever form it may present itself, but on *one express condition*—and here we speak as citizens and taxpayers of the City of Paris—and that is, that the trials should not be made at the expense of the city, but rather at that of the projectors of the new systems of illumination; in other words, the City of Paris should pay for the new light only at the same rate as that at which they would be charged for gas of equal illuminating power. Now, the price of gas to the public lamps in Paris is 15 centimes (1½d.) per cubic mètre (3s. 6d. per 1000 cubic

feet), from which amount must be deducted 0·02 centimes for *octroi* duty; consequently, each lamp in the Avenue de l'Opéra that was being paid for at the rate of 1 fr. 25 c. per hour, should represent, at 13 c. per cubic mètre, 9·614 cubic mètres, or the consumption of 48 gas-jets, each burning at the rate of 200 litres (7 cubic feet) per hour. We have no need of a vote of 2000 frs. to prove that the lamps in the Avenue de l'Opéra are not, by a very long way, equal to 48 burners, each consuming 200 litres of gas. And perhaps we may here be allowed to ask, How is it that the period at first fixed for the duration of the trials of the electric light, extending as it did over six months, was allowed to expire without any attention being bestowed upon photometric testings? Certainly, we have not at our disposal the means possessed by the Administration, yet we long ago tested for ourselves the illuminating power of the Jablochkoff lamps in the Avenue de l'Opéra. Further, we will indicate a very simple way of making a comparative trial of the electric light with gas—a trial that would not cost 2000 frs., and would, moreover, have the advantage of putting the public in a position to try the question upon the point of the lighting power of the new system. There are 34 Jablochkoff lamps between the Opéra and the Théâtre Français. Let only the 17 lamps on one side of the avenue be lighted, and on the other let there be placed 17 times 48 gas-jets, or 816 in all, each capable of burning 200 litres per hour. We are quite sure that no photometer will be required to ascertain the difference in the light produced. Then by extinguishing successively a certain number of the gas-jets, we shall arrive at a point of time when both sides of the Avenue will appear equally illuminated; this will show the equality between 17 Jablochkoff lamps and a given number of jets. Opinions may, at present, be divided as to the equality of luminous intensity; but we are generous, and will light up a few supplementary burners. Here is a practical trial such as we can comprehend; but what we cannot understand is, that the authorities should wait six months in order to have a sum voted for instituting photometric experiments. In this way the door is left open for speculation, while the duty of the Administration should be to close it as quickly as possible, by enlightening the public as to the value of the system of illumination under trial."

At the sitting of the Municipal Council on the 30th ult., it was decided that the lighting of the Avenue and Place de l'Opéra, the Place du Théâtre Français, and the *façade* of the Corps Législatif, by the electric light, should be continued up to the 15th of January next, in order to allow time for considering the bases of a contract to be eventually entered into with the Compagnie Générale d'Electricité. The terms upon which the lighting is to be continued are not, as before, at the rate of 1 fr. 25 c. per lamp per hour, but at the price that would be paid for gas. It is to be hoped that these six weeks will be occupied in determining, exactly and officially, the illuminating power and net cost of the new light.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

The Thirty-Sixth Quarterly Meeting of this Institution was held at the Mitre Hotel, Manchester, on Saturday, Nov. 30—Mr. HARRISON VEEVERS, Past-President, in the unavoidable absence of the President, Mr. Clarke, occupying the chair.

The minutes of the previous meeting were read and confirmed, and the following gentlemen were elected members:—

Mr. F. W. Brothers	Chorley.
„ A. C. Fraser	Barrow-in-Furness.
„ C. L. Hartley	Middleton.
„ J. Parkinson	Brighouse.
„ J. Riley	Bacup.

The members then proceeded to the selection of President for the ensuing year, their choice falling unanimously on Mr. THOMAS NEWBIGGING, of Manchester, who, in accepting the position, briefly thanked the members for the honour conferred upon him.

Mr. G. E. SAVILLE (Sowerby Bridge) read a paper on "An Improved Exhauster," which gave rise to a very interesting conversation, and having replied to sundry questions, a vote of thanks to him was proposed, and carried unanimously.

His permission to publish the paper, with drawings, was asked, and obtained.

Mr. W. CARR (Halifax) introduced the subject of the "Valuation of Gas-Works for Rating Purposes," in which he showed the very irregular manner in which gas-works are rated, scarcely any two assessments being on the same principle, and proving the necessity of gas managers looking carefully into the subject, as it was one, he said, which was evidently very imperfectly, if at all, understood by some of the assessors themselves. From tabulated replies received from various Companies and Corporations, he found, from the gross sums upon which the rates were levied, that the amount of the rates per 1000 cubic feet of gas sold varied from 1·17d. to 4·9d.

In the discussion which followed, Mr. NEWBIGGING pointed out that, according to the statute, rating could only be on rents, and not on profits; and the proper method of proceeding was to ascertain at what rent a tenant might reasonably be expected to lease the property from year to year. This was done in a way which was now well understood, and which he explained in detail.

Mr. MILES (Clitheroe), Mr. WALKER (Elland), Mr. ROBERTS (Altrincham), and others, referred to the systems pursued in their respective cases.

There was a generally expressed desire that Mr. Carr would arrange his notes, and allow them to be published. He, however, said he regretted that he could not comply with the request, as he had not had time to write a paper on the subject, and was afraid he could not undertake it.

A vote of thanks to Mr. Carr for his address, and to Mr. Veevers for his conduct in the chair, concluded the business.

The members then partook of tea together, and separated after spending a useful and agreeable afternoon and evening.

ON THE PRACTICAL APPLICATION OF ELECTRICITY TO LIGHTING PURPOSES.

By Mr. J. N. SHOOLBRED, B.A., M. Inst. C.E.

The Third Ordinary Meeting of the Society of Arts was held on Wednesday last, Dec. 4—Dr. C. W. SIEMENS, F.R.S., in the chair—when the following paper, "On the Practical Application of Electricity to Lighting Purposes," was read by Mr. James N. Shoolbred, B.A., M. Inst. C.E.:—

The object of the present communication is to present some of the results of a few of the actual applications of the electric light to illumination for industrial purposes, which have been in operation for a period of time, and under such conditions as to cause each to have passed beyond the stage of a mere laboratory experiment. Any cases or processes which have not passed beyond this preliminary stage, or which have not yet received actual industrial application, have, as far as possible, been avoided

The remarks which follow must be taken as the continuation of a communication, "On the Present State of Electric Lighting," made last August to the British Association for the Advancement of Science, the purport of which was the description of some of the scientific tools, such as electric machines, lamps, carbons, &c., which are made use of in practical illumination by electricity; while the present communication will endeavour to give the commercial results of the working of those instruments.

A general knowledge of the principles and form of construction of the best known of these electrical machines and lamps will, therefore, be assumed, in order to avoid again travelling over the same ground.

Periods in Electric Illumination.

Electric lighting, it will be found, divides itself very readily into certain marked periods, each representing a clearly-defined progress from that attained in the preceding one. It has been found convenient to divide them into three, which division will, in the following remarks, be still adhered to. These stages may be briefly described as—

1. That of lighthouse illumination by the Holmes and by the Alliance magneto-electric machines, giving off currents alternating in direction, and producing a single very powerful light.

2. That of dynamo-electric machines, producing a single light each, for industrial purposes generally, in addition to lighthouse illumination. The Siemens and the earlier Gramme are the best known in Europe of these machines, while the Wallace-Farmer and the Brush claim most attention in the United States.

3. That of machines both of magneto and of dynamo construction, and generally (though not necessarily) giving off alternate-direction currents; and which afford facilities, if provided with suitable lamps, for the production of a number of lights from each machine. Besides the already-named Holmes and Alliance Machines, and their recent and more compact successor, the De Meritens, all being of magneto construction, there are the Lontin (double) and the Gramme (double), which also effect this much-desired object. In all these machines the current given off is alternating in direction. The two last-named machines, though dynamo in construction and in principle, are by some persons classed as magneto machines in their operation, inasmuch as the initial or generating machine of each maker acts like a permanent magnet to its second or dividing machine, and affords to it a supply of electricity. Still, it may be replied, while the "generator" in each case most certainly acts on the dynamo principle, the "divider" does so also, as it greatly augments the electric current received from the former before it delivers it as its final output.

It may not be out of place here to mention that the word "magneto" implies (to the author at least) a machine where permanent steel magnets are used to induce the electric current in an electro-magnet—*i.e.*, where a coil of copper wire is wound round a cast-iron core; while the term "dynamo" indicates that electro-magnets only have been used in the construction of both the inductor and the induction parts of the machine.

Practical Applications.

First Stage.—South Foreland and Souter Point Lighthouses.—The Corporation of the Trinity House first used the electric light at the South Foreland in March, 1859, then for several years at Dungeness, and they have made use regularly of the electric light, as an illuminant, ever since 1871, in two of their lighthouses—at Souter Point, on the coast of Durham, and at the South Foreland, near to Dover. The apparatus employed in both cases is nearly the same. That at the last-named lighthouse formed part of the different electric apparatus made use of by Mr. James N. Douglass, the Engineer to the Trinity Board, in his experiments at the South Foreland, to ascertain the relative merits of certain electric machines as available for lighthouse illumination, and it is described in his report upon these experiments.

It consists of two of Holmes's magneto-electric machines, used either singly or coupled together, and driven by steam-engines of 10-horse power nominal. The current given off in each case is alternating in direction, and serves to feed a Holmes lamp with square carbons, generally of ¾-inch a side, the rate of consumption of the carbons being about 4 inches per hour, the actual motor power per light ranging from 3 to 4 horse power per hour, as indicated; while the intensity of the naked light produced has an hourly ordinary intensity (measured horizontally) of 1523 standard sperm candles with a single machine, augmenting to a maximum of 3046 candles when the two machines are coupled together. The annual cost of such lights, including engine power, carbons, wages of men, repairs, and interest at 7½ per cent. on first cost, is about £539; this is for a total of 5132 working hours during the year, and for a light of 1523 candles.

Lighthouses at Cape La Heve, Havre, France.—An Alliance electric machine is provided for each of the two lighthouses. Each machine is composed of six discs, of 16 coils each, and affords a light of about 2000 candles. The lighthouses were first lit up by electricity in 1863, and the illumination has continued regularly ever since. The following information as to expense has been kindly supplied by M. Allard, Inspecteur-Général des Phares, at Paris. The average annual cost, exclusive of interest, repairs, or depreciation, amounts to £660 for both lighthouses. If, for interest, depreciation, and repairs, £50 were added, this would stand at £710. The cost of maintaining a single light (in order to arrive at a precise parallel with the preceding case) is found to be about two-thirds of that where two lights are fed from a single source. This would, therefore, bring the annual expense at Havre down to about £474, for a light of about 2000 candles intensity.

Second Stage.—Lizard Lighthouse.—The Corporation of the Trinity House, in consequence of the recommendation of Mr. Douglass, supported by Dr. Tyndall—the result of the experiments at South Foreland just referred to—have established, now nearly twelve months ago, at this their latest application of the electric light, a series of six Siemens dynamo-electric machines, each of the type known as "4000 candles;" and these are driven by three caloric engines. Of the three electric engines thus formed, a single one may be driven, under ordinary circumstances, to produce one light of an hourly intensity of 4100 standard candles; or else the two may be coupled together, as is the case in thick weather, and an intensity of 8500 candles afforded to the light; the average amount of motor power per hour for a single machine being about three horses. The annual working expenses, under similar conditions to the preceding case, came to about £500 for a light of 4100 candles. The results at the Lizard, point, therefore, to a more abundant light produced at a cheaper rate absolutely than with the older machines at Souter Point and at the South Foreland.

While considering these applications of the electric light to lighthouse illumination, it is but right to remark that they take place under circumstances and conditions special to themselves, and which do not exist in the case of industrial or other works. These arise in part from the paramount necessity of providing in the lighthouse an illumination of the most perfect character, and abundant in intensity, as well as of providing an amount of extra plant to guard against any cessation in the illumination. The generally isolated situation of lighthouses also adds to the cost of the materials employed, and causes the personal staff employed to be of a more skilled class, than where assistance in the matter of repairs is readily available. Any comparison, on purely economical grounds, between the electric illumination in lighthouses and in industrial works, must necessarily be unfavourable to the former.

Northern of France Railway Goods Station at La Chapelle, Paris.—This Company finding that the night-work done in the goods sheds and in the yard outside was very inferior in amount to that done during the day (about 37 per cent. per head), and that, moreover, a considerable number

of small articles was mislaid and lost during the night-work, determined to try the electric light to improve matters.

A series of 6 single-light "Gramme" machines were provided, each of the size termed "A" (6000 candles), and a portable engine of 15-horse power nominal. A special shed was erected to contain the electric machines and the engine. Several forms of electric lamp were tried, but that made by Serrin was ultimately preferred; latterly, however, a modification of that lamp by Suisse has been used with great advantage, as it allows of 12 hours consecutive burning, in place of only 3½ with the original Serrin. The average length of the night-work was found to be 10 hours, with a maximum of 15 hours. The first outlay (intended for 5-light centres) consisted of six machines, six lamps, portable engine, shed, conducting cables, &c.; this, fixed complete, amounted to £1640. The electric lights were placed, one in a goods shed, the remainder in the open yard, so as to light up a row of turn-tables, where most of the night-work took place. The shed is 230 feet long, and 75 feet wide, with an open roof of 33 feet high at the ridge, and 16 feet at the eaves, and having a central skylight along each side for most of its length. The upper portion of the walls and the underside of the roof were whitened to aid in reflection. The electric light is hung near to the centre, in a simple lantern of ground glass, and at an elevation of 15 feet from the ground. The result of this illumination was to increase the efficiency of the night-work by 30 per cent. The original imperfect gas illumination had been carried on by means of 21 jets, burning 4½ cubic feet each. The new illumination was as effective as if these had been augmented to from 50 to 55, causing an hourly consumption of 220 cubic feet of gas. The light in the shed was found to give a good working light for a distance from it of over 100 feet, while those outside were satisfactory within a radius of 200 feet. The electric illumination commenced on Jan. 15, 1877, and has continued regularly ever since.

During this period a series of careful experiments were carried out by the officers of the Company. The results showed that on an average 2½ actual horse power was required per light per hour, sometimes a little more, sometimes rather less; and that the square carbons, of ⅜-inch a side, were consumed at the rate of 4 inches per hour, or at a cost of 1½d., waste included.

The nightly working expenses, with an average of four lights, and during ten hours, were found to be—

Motor power—2·5-horse power × 7·8 lbs. of coal × ten hours × four lamps	7s. 0d.
Carbons—four lamps × ten hours × 1½d. (nearly)	4 10
Oil, 8d.; wood, 1½d.; lighting engine-shed, 2½d.	1 0
Engineman's wages	4 0
	16s. 10d.

This gives a price per light per hour of 5d.; add to this 10 per cent. on first outlay of £1640; for interest and depreciation, 2¾d.—total cost per light per hour, 7¾d. (say, 8d.). This, to the Railway Company, would represent the cost of 22 gas-jets, while the electric light, in the shed, was considered to have satisfactorily replaced 52 jets—thus leaving an economy of 30 jets, or about 60 per cent. in favour of the electric light.

Iron-Works of Messrs. T. and T. Powell, Rouen.—In the autumn of 1876, Messrs. Powell determined to illuminate a newly-made erecting shop with electric light. It is a building 125 feet long by 45 feet broad, with an open roof 26 feet high at the eaves, and 40 feet at the ridge.

Two single-light Gramme machines, of the small or "M" size, with two Serrin lamps, conducting cables, &c., were provided, and fixed complete for £196. The lamps were suspended under the centre of the shed, 60 feet apart from each other, and at a height of 30 feet from the ground. No special motor was provided, the requisite power being taken from the engine which served to give motion to the tools, &c. A series of carefully taken indicator diagrams showed that, on an average, 2½ indicated horse power was absorbed by each light, which was found to contain an intensity of 1900 candles (measured horizontally). This illumination (costing actually 4d. per hour per light) would come out, if with an allowance for a special engine, and 12 per cent. for interest and depreciation, at a total expense of 2s. 10d. per hour; as against 7s. 7d. for an equally effective illumination with gas, at 7s. 8d. per 1000 cubic feet, the price in Rouen.

Messrs. Powell, after two years experience of the working of the electric illumination, and finding it so much cheaper, more effective, and safer than gas would be in their erecting shed, have decided to extend it without delay to the rest of their works.

A very considerable number of applications of this class of single-light electric machines, both of the Siemens and of the Gramme construction, exist in France and in this country, and serve for the illumination of industrial works differing very widely in character. The data, however, given in the above examples afford some test as to the capabilities and as to the working expenses of this class of machines.

Third Stage.—Paris, Lyons, and Mediterranean Railway Company.—Paris Terminus.—This Company, having decided to try the effect of the Lontin electric light, gave permission to the patentees of that system to enter upon a period of preliminary trial at their passenger station, to enable the Company to judge of the efficiency and economy of the illumination before finally adopting it. Twenty-eight electric lights distributed about the station, and replacing 172 gas-jets, were supplied with electricity by a combination of one generating and two dividing machines, all upon the Lontin system. The lamps used were the modification of the Serrin, introduced by M. Lontin, whereby a number can be employed upon one circuit (where only one of the original Serrin can be used). The power of each of these dividing machines was that known as of "18,000 candles." The motor power for this temporary arrangement was a Brotherhood 3-cylinder engine, supplied by steam from an old locomotive (lent by the Railway Company). This arrangement proved, however, to be wasteful in steam. The effective illuminating power of each electric lamp was considered to be equal to that of 80 gas-jets. The average cost of the 28 electric lamps during these preliminary trials would appear to have been about 8s. 2d. (10·35 frs.) per hour. This preliminary experience lasted from Sept. 7 to Oct. 28, 1877. The result was, however, sufficient to satisfy the Railway Company as to the effectiveness of electric illumination, and as to the possibility of its being carried on without interruption, and it induced them to enter into a contract with the patentees of the Lontin system to light up, for a period of twelve months, a large receiving shed in their goods station of the same terminus. Twelve lights were to be provided, all emanating from one dividing machine. The total cost per hour was 5s. (6 frs.), or 5d. (0·50 fr.) per light; the contractors finding everything requisite, except water, and bearing all working expenses.

Western of France Railway.—Paris Terminus, St. Lazare.—This railway decided, in the early part of 1878, to try the Lontin system of electric lighting at this station.

Goods Yard.—The patentees of this system commenced, in May last, to light up the goods yards, on the arrival side. For this purpose six electric lights are placed against the columns which carry the roof, at a height of about 12 feet from the ground. They are provided with electricity from a Lontin (double) machine, of the type known as of "12,000 candles."

The motor power is afforded by an agricultural engine of 9-horse power nominal, the piston being 9½ inches in diameter and 13 inches stroke, the average pressure in the boiler being 83 lbs. per square inch, and 110 the average number of revolutions per minute of the fly-wheel, the total consumption of coal per hour being about 80 lbs. The lights were found, by a series of careful experiments, to be of a mean luminous intensity of 480 candles each. They are generally left naked, without any ill effect being produced upon the persons below.

The lamps used are the Serrin, modified by Lontin, so as to admit of several being placed upon one circuit; in this instance they are placed in pairs, six lamps upon three circuits. The consumption of the ⅝-inch round carbons was found to be at the rate of 1½d. per light per hour.

The average working expenses of these six lights are, per hour—

Coal, &c., for engine, at 32s. per ton	1s. 2d.
Carbons for six lamps	0 8
Engineman and stoker	0 10
Total hourly cost for six lamps	2s. 8d.
Or per light per hour	0 5½
Add for interest on outlay, for depreciation and repairs	0 2½
Total hourly expense of each light	0s. 8d.

Passenger Station (Departure Side), Salles des Pas Perdus.—In the month of June, the Directors of the Railway Company determined to extend the electric illumination to this portion of the station. Accordingly, the patentees of the Lontin light fixed for this purpose twelve lights, supplied from an 18,000-candle Lontin machine, which was placed, together with an agricultural engine of 12-horse power nominal, at first in the cellars of the station, near to the Rue St. Lazare. It was afterwards removed above to the station itself, in a shed constructed for the purpose. This removal necessitated some interruptions in the regular lighting. The engine is of the following dimensions:—Diameter of piston, 11⅞ inches; length of stroke, 13 inches; revolutions of fly-wheel per minute, 110; average boiler pressure, 93 lbs. per square inch.

Each electric lamp is enclosed in a ground glass circular lantern, in the form of an inverted truncated cone, with a metal top to it, while the body of the lamp, protruding below the lantern, is placed in an ornamental bronze case, the whole having the appearance of an elegant moderator lamp.

The difference in the illumination between this side of the station and the goods yard side, where the lights are naked, is very marked; and leaves an impression very much in favour of the enclosed lights, which diffuse the illumination and render it more uniform. The effect in the large hall called the "Salles des Pas Perdus," which is 445 feet long, 66 feet wide, and 20 feet high at eaves, and nearly 40 feet at ridge, is very good. Five lamps from the centre, suspended from an elevation of about 18 feet from the ground, light up this fine hall.

The twelve electric lights in this part of the station are placed upon three circuits; four lamps upon each.

Street Lighting in Paris.—The Jablochkoff Candle.—Of the various streets and other places lit up by this system, the Avenue de l'Opéra is the one which, from its central position, has attracted most attention, and therefore will be taken here as a type example.

The Avenue de l'Opéra, including the Place de l'Opéra at one end, and the Place du Théâtre Français, are lit up by 62 lights; 46 single candles, and 8 double candles, on the Place de l'Opéra. Originally, only about 40 were provided, but the illumination being insufficient, the number was augmented (at the contractor's expense) to the amount just stated.

These are divided into four groups—one on the Place de l'Opéra; two in the Avenue de l'Opéra; and one on the Place du Théâtre Français. Each group of lights is supplied with electricity from a (double) Gramme 16-light machine, driven by an engine of 20 nominal horse power.

A very considerable amount of mystery has been kept up by the patentees, of this system as to the cost of it. The expense they state it to be is 1·06 fr. 11d. (nearly) per light per hour, which they hope, so it is said, shortly to reduce by one-half. However, the payment to the patentees by the City of Paris, is at a rate of 1·25 fr. per hour on each of the original lights stipulated in the contract, the augmentation to 62 being entirely gratuitous by the contractor, and in order to keep up an effective illumination. The total remuneration is 37·2 frs. (29s. 9d.) per hour. The original gas illumination consisted of 344 jets, and costs 7·224 frs. (6s.) per hour. The electric illumination is considered, however, as equal to 682 gas-jets—say, to double the original illumination; that is, to a cost of 14·45 frs. per hour, as against 37·2 frs. for the electric one. The latter, therefore, cost 2·6 times that of the gas of equal illuminating intensity.

Need it be added that the City of Paris have terminated the contract with the last day of November?

The contractors have, however, offered to continue the contract at the reduced rate of 0·60 fr. (6d.) per light per hour. The Municipal Council of Paris have declined to continue any contract, except provisionally up to January 15, 1879, and that only at the rate of the original cost of the gas—viz., at a total expense of 7·224 frs. (6s. nearly) per hour. By information lately received from Mons. Allard, the Chief Engineer of the lighting department of the City of Paris (under the Engineer-in-Chief, Mons. Alphand), and by whom the above details have been kindly communicated, the contractors for the lighting—the Société Générale d'Electricité—have consented to undertake the lighting at the above reduced rate. The price paid to them, therefore, will be, up to January 15 next, at the highly remunerative rate of about 1½d. per light per hour.

A series of very careful photometric measurements, carried out by the Municipal Authorities in the Avenue de l'Opéra itself with the existing illumination, showed each light to possess a maximum of 300 candles of intensity with the naked light; while, by the interposition of the opaque globe, the maximum was reduced to 180 candles (a loss of 40 per cent.) and this again to a minimum of 90 candles during the darker periods through which this light passed.

Many other applications of the Jablochkoff candles with the Gramme machine occur in Paris, such as at the Magasins and the Hôtel du Louvre, at the Théâtre du Châtelet, at the Hippodrome, at the Hôtel Continental, &c. Still, as in none of these cases have the financial results been ascertained on such good authority as in the case of the Avenue de l'Opéra, it has been thought advisable to pass them over. The main object, held constantly in view in the present communication, has been to ascertain the carefully-prepared financial results of a few applications, which have been supplied on unimpeachable authority, rather than to attempt to present those of a larger number, in some of which the results might have been open to doubt.

Rapieff Light at "The Times" Office, London.—So much attention has, in this country at least, been drawn to this, one of the latest novelties in the application of the electric light, an interest due mainly to the peculiar form of lamp used in conjunction with the Gramme machine, that one can hardly conclude this brief notice of electric light applications without saying a few words about it. A Gramme (double) "16-light" machine has been provided at *The Times* office by the proprietors, together with an

engine suitable even for future emergencies, and a portion of the lights, six in number, in the machine-room, all in one circuit, have been set in place. A much larger addition to the number, in other parts of the building, is shortly contemplated.

Owing to the fact that only a portion of the intended application has so far been got to work, and that only recently (since the 12th of October last), it is not possible, nor hardly fair, yet to judge of the actual results. Still the system works fairly, and it may therefore be entitled to take rank as an established application of electric illumination.

In the preceding remarks on the various applications of electric lighting to illuminating purposes many, very many, of a highly interesting character have been omitted. Amongst these might be named those for military and naval purposes, for the construction of large works out of doors, such as docks, bridges, &c., for weaving and spinning operations (where the purity of the electric light is of peculiar advantage), for agricultural, and for other classes of night-work, too numerous even to name. This omission has been necessitated partly from want of time, partly from want of those very careful and even scientifically prepared results which were desired. It is hoped, however, that the few and carefully selected examples presented will afford some slight guide as to the results, financial and otherwise, which effective electrical illumination may be expected to afford.

Luminous Intensity.

Continuous . . . . . { Lemmonier—Gramme. / Douglass—Siemens.

Alternating . . . . . { Allard—Alliance. / Lafaurie—Lontin. / Allard—Jablochkoff.

Irregularities—Lafaurie . . . { Yellow from electricity. / Red „ lamp. / Green „ neutral.

Motive Power.—Mechanical Questions.

Divers motors . . . . . { Steam. / Gas. / Water. / Hydrocarbon.

In the course of the discussion which followed,

The Chairman said the electric light was not a thing of yesterday. The first proposal to produce light by electricity dated back to Sir Humphry Davy at the beginning of this century. Sir Humphry Davy produced a very brilliant arc with 3000 Wollaston cells, and shortly afterwards a still larger arc was produced with 600 Bunsen cells. They were now approaching the end of the century, and were still wondering whether the electric light would be a success. The difficulty which immediately presented itself was its great cost, for to maintain 600 Bunsen cells for a single light meant an expenditure which put the light altogether out of the question for commercial purposes. It was not until 1831 that a new ray of light was thrown upon this question, through the brilliant discovery of Professor Faraday. In that year he elicited an electric spark from a steel magnet; and, small as it appeared, it was the origin of a great revolution in the applied arts. The effects obtained by the experiment were very small, and it was not until Pixii, in 1833, constructed an electro-magnetic machine, which was soon after improved upon by Clarke, that a continuous succession of electric sparks or currents was obtained by means of a permanent magnet. This was taken advantage of by Professor Holmes, in 1856, when he constructed his celebrated magneto-electric machine, which was still used for illuminating many lighthouses in France and elsewhere. The next important step was the invention or discovery of magneto-electric currents, which was claimed by several men of science. Professor Wheatstone and himself had brought papers before the Royal Society at the same time, and his brother had brought one before the Berlin Society somewhat earlier. No doubt, as often happened, the same idea occurred to them all. Mr. Varley, although he did not publish what he had done until lately, had also worked in the same direction. With the dynamo-electric machine they had the power of magnetism developing a current, turning mechanical energy into electrical energy, without much loss, for the loss for converting energy into current was not more than 30 per cent.; this was less than the result obtained in any other mechânical conversion. With this power, therefore, they had an engine which converted mechanical force into electrical force, and electrical force into light, by a process which was now perfectly well understood. There remained, however, the further question to be solved: Given the power of the light, how could it be put in such form as to be suitable for the purposes of mankind? The room was at that moment lighted by one of his own electric lamps, worked by his machine. He was sorry to say that it had not always been steady; but this want of steadiness was not the fault of the lamp. If the motive force had been uniform the light would also have been uniform; and he had just been informed that at the time when a considerable alteration took place, the steam in the little engine used to drive the machine had fallen from 70 lbs. pressure to 55 lbs., and the dynamo machine was brought almost to a standstill. It was always a difficulty, in temporary arrangements, to maintain steam at anything like a steady pressure, and hitches always occurred in getting up hurried experiments. There was, however, a more serious difficulty in the electric lamps of the present day—namely, the carbon consumed; for its re-adjustment required mechanism which was not yet absolutely perfect. Nor was the carbon absolutely perfect. Great improvement had been made in the carbon rods, and he had worked an electric lamp which for hours remained almost absolutely steady; but when the power varied, the imperfections of the carbon also showed themselves in an increased degree. Mr. Shoolbred had alluded to a great many proposals for overcoming the practical difficulties which now stood in the way of making the electric light successful. There were two different systems—the one with fixed carbons and alternate currents—of which the Jablochkoff was a type—the other with a continuous current. The reversed current had many advantages for distributing and subdividing the light, whereas the fixed had the advantage of being more economical. He considered that, in resorting to reversed currents, and bringing the light down to the position which gas-lamps generally occupied, 60 to 70 per cent. of the maximum effect was sacrificed, and the result was that the electric light was expensive; whereas if concentrated and distributed over a large area, it could be obtained cheaply. It was only for the engineer who had the arrangement of it to make it face in such a way as not to be inconvenient. He had heard a great deal about inventions for subdividing the electric light indefinitely, but he did not attach great importance to that, as the electric light would not take the place of gas for our streets or in our houses, though it would come to be used largely for lighting halls and large public places of every description; but even if they could subdivide the light to any extent, it would be found that such subdivision would reduce the economy. As far as his experience went, it was rather a question of concentrating than subdividing.

Mr. James N. Douglass said he had been connected with the electric illumination of lighthouses for many years, and he remembered how, at one time, Faraday was highly pleased with the light, and thought it was a pity it was so expensive. At the present time, thanks to Messrs. Siemens, the light was produced at about one-fourth of the cost at which it stood 14 or 15 years ago. With regard to steadiness, at the Souter Point Lighthouse, the electric light had been shown continuously for eight years, with only two stoppages—on one occasion when the light-keeper went to sleep; and on the other owing to a bad carbon, a piece of the carbon fell and broke the contact, and there was a temporary suspension. An oil lamp was always provided, in case of accident, and it was burned one hour a week in order to be sure it was in readiness, but they never had occasion to use it. On the question of cost, of course, a lighthouse was no criterion; but at the present time, putting aside the cost of plant and attendance, they could, with 1 lb. of coal, produce nearly 20 times the amount of light which coal would yield if distilled into gas. That being the case, he thought the question might be safely left to the mechanic. Allowing for the cost of carbons, they obtained about ten times the amount of light produced by coal distillation. With regard to subdivision, he should be inclined to agree with the Chairman. They had heard nothing lately from Mr. Edison, and he thought that for gas shareholders there was still hope in domestic illumination, though for large places there was no doubt a cheaper and more efficient illuminant in electricity.

Mr. F. W. Hartley asked whether the estimates of illuminating power had been taken at the maximum, minimum, or mean? As an old photometrist, also, he should like to know what system of photometry was employed, and he was rather inclined to doubt whether any system would enable an accurate comparison to be made with the electric light. The eye was always very liable to be deceived by intensity.

Sir Charles Bright said that great improvements had been made during the last few years in machines for generating the electric current. He thought the great point for inventors now to turn their attention to was the lamp itself, which was far from perfect. Several were before them in the room, and there were about 30 patents still unspecified; but he was not at all sure that the right thing was yet obtained.

Mr. Spencer thought the great question at the present time was, whether the electric light could be distributed without loss. There was a diagram showing how the current from one machine could be divided into twelve. What he should like to know was, whether each separate current was equal to 1-12th of the whole.

Mr. Applegarth, in the absence of M. Rapieff, explained the construction and action of his lamp. The main object, he said, was to secure that if an accidental interruption of the current, or an extinction of the volatic arc, took place, the extinction should be of as short duration as possible. There was a small magnet at the bottom of the lamp, and if an extinction took place, this magnet came into operation, and brought the carbons together almost simultaneously. The Rapieff lamp was in use at *The Times* office, where it could be seen on application on any Tuesday or Friday evening; and it would have been shown that evening, but there was not sufficent time to prepare for it, and he preferred not lighting it at all to running the risk of failure. Mr. Shoolbred said it was necessary for the Rapieff lamp to stand upright, but that was not so. In the particular form exhibited, it was; but, as the carbons were actuated by gravity, it was perfectly easy to make them approach horizontally as well as perpendicularly. He showed a new lamp with vertical carbons set side by side, and separated by a narrow air space, like the Jablochkoff candle with its separating layer of kaolin. The difference betwen Rapieff's *bougie électrique* and the Jablochkoff candle was this—that Rapieff took the carbons as they were, and put them into his candlestick, and burned them; whereas Jablochkoff had to send the carbon to a factory to be made into a candle, with insulating substance between. Now, all insulating substances, when cold, were non-conductors, but when hot they became conductors, and consequently as soon as the insulating substance became hot, part of the electricity was conducted down to the earth, and was lost for the purpose of illumination. There were now six lights in the machine-room of *The Times* office, and they were going to put up six others in the composing-room. When that was done he was sure it would be successful; and they would have killed two birds with one stone—viz., shown the suitability of the light for the most delicate purposes, and got rid of that extreme heat which was killing many good men who had to work all night by gaslight. He did not believe that electricity would take the place of gas for domestic purposes, at any rate in this century, but it was very suitable for large public buildings and manufactories, and it was useless for gas companies to shut their eyes to this fact.

Mr. W. H. Preece said some ingenious statisticians had endeavoured to show that famines, potato disease, and other things of that kind, had regular periodical recurrences, and amongst these periodical strange sensations must be now included the electric light, for it had, more or less, repeated itself regularly at periods of ten years. In 1847, the National Gallery, the Duke of York's Column, Trafalgar Square, and the Polytechnic were illuminated by the electric light, and Dr. Bachhoffner used to attract audiences like the present to see it; but, after a fitful existence, it disappeared. It came to light again in 1857, when some one in Belgium succeeded in subdividing the light, and, as he thought, producing a light ten times as cheap as gas; but he failed. The attention of Faraday was directed to the matter, and, with the aid of Professor Holmes, the electric light was made a practical thing for the time being. The Trinity House took it up; it was tried at the South Foreland, and was practically applied to the Dungeness lighthouse in 1862, but from that time to this they had really advanced very little. This would be seen by referring to Proessor Fleeming Jenkin's report of that year, wherein would be found almost everything which had lately re-appeared on the subject. When the Prince of Wales was married, in 1863, Professor Pepper tried to light up the dome of St. Paul's, and a little flicker was seen, but nothing more. Mr. Ladd succeeded better in throwing a light on the Monument, and one or two other public buildings in London were lighted by the new light. In 1867, at the commencement of the next decennial period, several electric lamps were shown in the Paris Exhibition by Leroux and others; but it again died out, until quite lately. He did not pretend to run down the electric light, or to crack up gas, for, in his opinion, each had its own sphere. He belonged to a large establishment where a great many hands were employed, and their gas bill came to thousands of pounds a year, so that it was a matter of extreme urgency to find a light which would be superior, not on the score of economy, but to do away with the vitiation of the air, which was so unhealthy. He went to Paris, and everywhere where the electric light could be seen, but he had laid down three desiderata, which he had not yet found accomplished. The first was that the light must be absolutely steady; secondly, it must be brilliant, giving a light of 1000 candles or more; thirdly, it must be durable. Of all the lights, the only one he had seen which came up to his standard of brilliancy was the Serrin, of which the one they had seen that night was a modification; the only one which came up to his criterion of steadiness was the Werdermann; and the only one sufficiently durable was the Wallace—by which he meant one that would last all night, and nights in England sometimes lasted eighteen hours. But there were several which came pretty near these criteria. The Rapieff seemed very efficient, but it was not quite good enough, and, therefore, they had not yet introduced the light into the Post-office. His ttention had been much directed to the subdivision of the light; but it

seemed to him a kind of *ignis fatuus*, or philosopher's stone, for this simple reason, that the experiments he had examined showed that, when the light was divided, the intensity diminished. He looked upon the subdivision of the light as a practical impossibility. At the same time, he had not made these experiments himself, but they were to be found in the last chapter of M. Hippolyte Fontaine's work on the electric light. Other experiments had been made with incandescent light, of which so much fuss had been made in America. He did not know much about this Edison light, but he knew Mr. Edison. He visited him in America some two years ago, and spent two very pleasant days in Mr. Edison's laboratory. He was an extremely ingenious man, but his ingenuity often carried him to extremes. He was an American of the Americans. It was said of an American infant that he would improve his cradle, get out and patent it, and get back again. Mr. Edison had taken out 269 patents, but he only knew of three that were at work. Not having seen Mr. Edison's light, he could not say very much about it, but he feared he had tumbled into a tremendous mare's nest, and that with two 80-horse power engines and a lot of money he was going to flounder out of it. He thought that it was not in the shape of subdivision, but of condensation, that the light would be improved and made fit for use; and, for the purpose of illuminating large rooms, workshops, railway stations, squares, and places of that kind, the electric light would come out of its present difficulties, and be, in fact, the light of the future.

Mr. W. H. Bennett asked what practical means had been adopted for determining the illuminating power of the electric light; because it was manifest that the ordinary photometer was not adapted for the purpose.

Mr. Ladd said he had been working at this subject for a good many years, and he might therefore say a few words. He did not wish to alarm gas shareholders, for if he had any gas shares he would keep them; but he simply wished to call attention to the Wallace lamp, specimens of which were on the table. He was quite certain that of all the lamps he had seen there was none to equal this for durability or steadiness. One of them would burn for 100 hours. It was used for days and nights in a factory, and for many hours burnt continuously. There was no clockwork in it, but simply an electro-magnet, which worked so instantaneously that a flicker would scarcely be seen. Moreover, it was so constant that, with a Wallace lamp, six or eight lights would burn in a circuit. Something had been said by Mr. Shoolbred about the Lontin machine giving six or seven lamps in circuit; but this was not so, as any one could see by going to the Gaiety Theatre and examining the lamps for himself. There were six or eight lights burning, but there were as many services leading to them, which meant a very different thing from one circuit. There was a wire for each lamp, and one return wire for the whole. In the Wallace machines and lamps two wires were led from the machine, and each lamp was connected to them. One-horse power was reckoned for each light, and one for the wire. If additional light was wanted, all that was required was to put on a little more steam and speed, and three, four, or more lights could be obtained accordingly. There was no difficulty in getting rod carbons, such as were used in most lamps, but the plate carbons used in the Wallace lamp had to be made specially. The advantage of this was that there was a large body of carbon sufficient to convey the whole of the current, whilst with the small ones in the Jablochkoff light a good deal of the current was necessarily lost. The plates were also much cheaper, taking into account the time for which they burned.

Mr. Shoolbred, in reply to Mr. Hartley, said he had shown in two of the diagrams both the maximum and minimum light, and it was evident that this had been taken into consideration in making the comparison. With regard to the difficulty of making a comparison of light, he was informed that the gentleman who took the observations of the Lontin light did his utmost to obtain a fair comparison; he tried different coloured glasses, and found that some favoured one light, and some the other, and the one which most assimilated them was green, and he accordingly carried out his operations by the aid of green glass. With regard to the duration, he understood that the Suisse lamp had been in use for 12 or 14 hours consecutively.

Votes of thanks were then passed to Mr. Shoolbred for his paper, and to the Chairman and the gentlemen who had lent the different apparatus exhibited, and the meeting terminated.

AMERICAN GASLIGHT ASSOCIATION.

[Condensed from the "Official Report" in the *American Gaslight Journal*.]

The Sixth Annual Meeting of this Association was held at the Fifth Avenue Hotel, New York, on Wednesday, Oct. 16—General Charles Roome, the President, in the chair.

After the election of new members,

The President delivered the following

INAUGURAL ADDRESS.

Gentlemen of the American Gaslight Association: We again have the pleasure of meeting together to consider matters connected with the vast interests committed to our supervision, and I trust I do but echo the general sentiment when I express the great pleasure it affords me to greet you once more, and to be able to say to you that our progress during the year has been in the highest degree satisfactory.

As I have had the honour of saying to you on former occasions, we move only in accordance with the fixed laws of science, which we cannot alter if we would, but which we may reasonably confess have not yet been entirely revealed to us, for we know that what we have accepted in the past as absolute truth has, in the course of study and investigation, been demonstrated to be otherwise; hence, we see that it still remains for us to wrest from the hitherto unknown whatever may appear calculated to lead us in the path toward perfection.

Permit me to suggest that, although many of us have given the best years of our lives, and the most earnest devotion of which we have been, and are capable, to the advancement of our profession, still we are none of us masters, in the sense that there is nothing for us to learn, but only students, willing to sit at the feet of any one that can teach, and from whose experience we may learn. Let me say, too, that we come here not with any selfish motives, not for individual advancement or the acquisition of personal fame, but only and always that, placing the fruits of our individual study and application upon the common altar, we may cull therefrom the choicest flowers, and in our own homes and laboratories draw from them the incitement to future and better progress. Whatever we may gain is not for ourselves, for we must pass away and be forgotten, but for the interests of the people and the credit of the nation. On the principle that he who makes two blades of grass grow where only one grew before, is a national benefactor, so it is that in our profession, as, indeed, in any other, he who by his study and devotion contributes to the comfort and convenience of the people, confers a national benefit. So again, we Americans, by which I mean we who people this North American Continent, young still in the world's history, are competing with the Old World; and, whenever we can surpass its denizens in the arts and sciences, we have double cause for rejoicing, not only that we have added to our own national fame, but that we have contributed our share to the advancement of intelligence on those distant shores from which, in the natural order of things, we might expect to receive rather than to impart instruction.

I greet you again, then, gentlemen, as the appointed representatives of a business interest, which involves the very highest sanctions of science, and the best convenience of the people.

It is one of the most common topics of newspaper criticism to ascribe to our profession a desire to accumulate gain, without regard to the means leading to it, and yet, on your behalf, I venture to say that there is no business where there is a greater desire to afford the product of industry at a closer remuneration than this, and none where those on whose behalf such business is carried on are more disposed to believe all that is said by persons inimical to us and our industry. Out of the labours of this Association there ought to grow—nay, there is growing—a different appreciation; and I look forward with confidence to the time when our labours will be recognized and accepted as one of the agencies tending to the elevation of our national character, and giving us a rank not to be outshone by the labours and discoveries of Europe, hoary with the dust of centuries.

We are here, gentlemen, to consider what has been accomplished during the year now drawing to its close, and to unite in counsel for the history we are to make in the future. Let us not forget that whatever we may have achieved is simply a stepping-stone to further and more important advances. Sir Isaac Newton, when complimented upon his discoveries in science, said, "I am like a man standing upon the sea-shore; it has been permitted me to pick up here and there a few pebbles, but I cannot forget that there is a whole ocean before me." And Daniel Webster once remarked, "We wonder at startling discoveries made from time to time; but we go on from age to age, and find this earth a constant study, affording delight and rewarding our every effort."

Such is our chosen mission; we have voluntarily made ourselves the apostles of study and devotion, and while we are in the discharge of our duties as such, there can be nothing too simple nor yet too recondite for our examination. Let, then, the most modest among you, who imagines that he has discovered some principle or process hitherto concealed, frankly explain it here among his peers, and let us all approach its discussion in the spirit that becomes earnest, serious men, and so out of our deliberations will come that which we seek, and for which this Association was organized—"the greatest good of the greatest number."

It may perhaps be expected that I should refer in this brief address to various matters that have been presented to me during the recess. I am free to say that many such have received my most careful attention and earnest consideration, but I do not feel at liberty to forestall your opinions, even constructively, by expressing my own at this time. It is rather to be desired, as the words already spoken will demonstrate to you, that each should examine for himself the matters that may be presented, and out of our mutual counsel there will grow at least an approximation of the truth. By such communion we shall separate with the impression of friendly counsel, and, I doubt not, the conviction that the world is not yet ready to dispense with gas light.

Reports of Committees.

The Executive Committee presented their report which gave rise to some considerable amount of discussion. The principal recommendations of the report were that Mr. W. W. Greenough, of Boston, should be elected to honorary membership; that the salary of the Secretary and Treasurer should be fixed at 250 dols. for the ensuing year; that the surplus funds in the treasury after each annual session should be safely invested by the Treasurer, with the approval of the Finance Committee; and that the President, Secretary, and Chairman of the Executive Committee should be a Committee on lectures. These were all agreed to with the exception of the one fixing the salary of the Secretary at 250 dols., being 100 dols. less than for the present year. On a vote, by a majority of 39 to 19, 300 dols. was settled as the amount to be paid.

The Treasurer reported that, including the cash in hand from the previous year of 169 dols. 32 cents, the income of the Association for the year was 1070 dols. 49 cents. The disbursements were 445 dols. 89 cents. Balance in hand 624 dols. 60 cents. Number of active members on the roll, 188. Honorary Members, 3.

The Committee to nominate officers reported the election of the following:

List of Officers for 1878-79.

President.

General Charles Roome, New York.

Vice Presidents.

Mr. T. Littlehales, Ontario. | Mr. G. B. Neal, Charleston, Mass.
Mr. W. H. Price, Cleveland, O.

Secretary and Treasurer.

Mr. C. Nettleton, New York.

Finance Committee.

Mr. J. S. Chambers, Trenton. N.J.
„ J. P. Harbison, Hartford, Ct.
„ G. A. M'Ilhenny, Washington, D. C.

Executive Committee.

Mr. G. D. Cabot, Lawrence, Mass.
„ H. Cartwright, Phila., Pa.
„ W.H.Denniston, Pittsburgh, Pa.
„ G. A. Hickenlooper, Cincinnatti.
„ F. C. Sherman, New Haven, Conn.,
„ H. Stacey, Indianapolis, Ind.

The members then adjourned till the afternoon, when the reading of papers was proceeded with.

Major Dresser (Editor of the *American Gaslight Journal*) read the following paper upon

LONDON GAS-WORKS.

In endeavouring to convey to you some idea of the gas-works of London, it is not with a view of presenting anything especially new, or of making any comparisons between works there and here, that I have consented to prepare this paper.

The first point that I would impress upon your attention is the magnitude of the operations involved in lighting a great city; and, secondly, the corresponding responsibility placed upon the shoulders of those to whom the management of these operations is intrusted; hoping that the result of such impressions would be to raise the standard of excellence which you as Engineers and Managers may set up for yourselves.

And here let me repeat what has been said to you before by our worthy President: "There is no more honourable profession than that of a Gas Engineer," and no branch of engineering requiring a wider range of acquirement, or more skill in the application of the fundamental principles upon which engineering science rests. And one of the first things that a little attention to the *personnel* of the management of the London Companies suggests is that the gentlemen in charge of those vast works are men who have fitted themselves for their positions by close and continued application and study.

With many of these it was my good fortune to meet, and in every instance I was received with a whole-souled hospitality, cordiality, and frankness that I must attribute much more to the relations that I sustain to you and your profession than to any personal worthiness of my own; and I am sure that the establishing of friendly relations between the Gas Managers of Great Britain and those of America will even be more than heartily seconded by our English cousins. And some of us may see the day, I trust, when a joint meeting of the British Association of Gas Managers and the American Gaslight Association may be held in the city of New York in October of the year 18—.

The population of London is not far from 5 millions, and there was distributed (gas sold) among this number of people during the year 1877, by the principal Companies, 15,185 million cubic feet of coal gas. There was manufactured, 16,364 million cubic feet. The amount of coal carbonized was 1,614,246 tons, of which 5 per cent. was cannel. [If a man counts 100 every minute, and counts 10 hours a day, it would take him nearly 17 days to count one million.] The price of gas sold varied from 3s. 2d. to 4s. 4d.; but the average price was about 3s. 6d. (87½ cents) per 1000 feet.

London is at present lighted by the following Companies:—

	Formed.
1. The Gaslight and Coke Company (commonly known as the "Chartered"), with which, at various times, the following Companies have been amalgamated, viz.: the Imperial, the Independent, the City of London, the Great Central, the Equitable, and the Western	1810
2. The Phœnix Company	1816
3. The South Metropolitan Company	1833
4. The London Company	1833
5. The Commercial Company	1847
6. The Surrey Consumers Company	1854
7. The Crystal Palace District Company	1854
8. The Lea Bridge District Company	1868
9. The West Ham Company	1846

Of these, the first six are known as the Metroplitan Companies, the three latter being situated in what was, but a few years since, the suburbs, although now they are now no longer so, but are simply in the outer portions of London.

It may not be inappropriate here to say a few words upon the government of London. The "City," so-called, comprises but a small portion of London, situated near its centre. It is only over this small portion that the Lord Mayor presides. There is no one general government having control of the whole, but the different portions are governed by "Vestries," who are elected by the people of the district comprised within the various limits by which the different parishes are bounded. These districts were undoubtedly once church parishes simply, and the Vestries had the government under their charge. The paving of the streets and the lighting of the same are now under their control, so far as making contracts is concerned.

The Metropolitan Board of Works is composed of members elected by the Vestries, and was created by Act of Parliament, to have the general charge of certain public works, where a unity of action was necessary, that could not be obtained by any attempt at co-operation between the Vestries of the different parishes—as, for instance, the construction of the general sewers of London, the construction of the Thames embankment, and works of such general nature. The Metropolitan Police are also established by Act of Parliament, and are under a Board having general jurisdiction. There is also another Board, known as the Board of Trade, and it is under their jurisdiction that the Gas Referees act.

Of the Metropolitan Gas Companies named, The Gaslight and Coke and the Commercial Companies are on the north side of the Thames. The Surrey Consumers, the South Metropolitan and the Phœnix Companies are on the south side, while the London Company, having the principal portion of their district on the south side of the river, still have a portion on the north.

Of The Gaslight and Coke Company, or, as it is commonly called, the "Chartered Company," it is the largest, as it has been gradually increased by amalgamation with other Companies. The wisdom of this course is too evident to all Gas Managers to require comment, and the results obtained in the practical working are the most positive proofs of the advantages to be derived by both consumers and shareholders, by reducing the number of Companies and bringing the operations under the guidance of a single direction.

Efforts are now being made to secure a still further amalgamation, by uniting the Chartered, the Surrey Consumers, the South Metropolitan, and the Phœnix Companies. Should this be brought about, as it doubtless will be in time, the further union of this Company with the remaining ones would doubtless follow; and, under the legislative control to which they are subject, it would appear that the sooner London can be lighted by one Company, the better it will be for all concerned, and the cheaper will be the price of gas to the consumers. The whole system of organization and accountability is very different from ours. If a Company desire to raise additional capital, for the purpose of extending their works, a Bill must be presented to Parliament, setting forth what is required, and the matter is considered by a Committee to whom the reasonableness of the sum asked to be authorized must be shown; and when granted, of late years, it has been done under certain regulations as to disposing of the additional stock by auction, under what are known as the auction clauses, and also restrictions as to dividends, by which, when the amount of earnings exceed a certain per centage, the price of gas must be reduced. The result is that no more stock is issued than is expended in works, and the return upon the investment made is reasonably sure, inasmuch as certain reserve-funds are allowed, from which deficiencies in the dividends may be made up, in case that, from some unforeseen reason, the profits of the year are insufficient.

Published accounts are required in certain prescribed forms, from which the operations of the year are made known. There is no question that the publishing of the accounts does much to remove many false impressions and much mystery about the supposed fabulous profits of Gas Companies.

The amount of capital authorized for the six Metropolitan Companies is 77,815,890 dols., while of this sum 59,200,000 dols. is actually raised. Of this amount, the Chartered Company have 40,000,000 dols. raised.

It is difficult to convey an accurate idea of the business of this Company. They have some ten stations in different parts of London, on the north side of the river. Of these, the famous works at Beckton are the largest, where last winter they sent out 20 millions of cubic feet of gas in a day. These works are practically six works placed together. They are situated on the river below London, on ground belonging to the Company, of some 400 or 500 acres in extent. All the equipments of these works involve the application of the most recent improvements in steam and hydraulic machinery.

A large pier is constructed in the river parallel to the banks, connected with the shore and the works by a viaduct carrying several railroad tracks. Large steamers come alongside this pier, and are discharged with great rapidity by means of steam-hoists placed below the deck of the pier, into trains of cars, which convey the coal directly to the retort-houses. A complete network of railroad tracks enables every part of the works to be reached, both on high and low level, by steam cars. Some 15 locomotives are owned and used here by the Company.

The retort-houses are arranged with coal-stores on each side, from which the coal is shovelled directly into the retorts. Foulis's mechanical stoker is used for drawing and charging in a portion of the works.

The settings are usually sixes. The retorts are D's and "throughs," made in three pieces, and joined in the setting. Coke cellars below receive the coke as it is drawn. They work with a seal, and use the self-sealing lid. The condensers, purifiers, &c., are in the open air. Very large works for the working up of tar and ammoniacal liquor were in progress of construction, the design being to convey the tar and liquor from the other stations to this point for manufacture.

The works, as designed, are not yet all built, but are being extended each year.

Two 48-inch mains convey the gas to London, and much of the gas made in the daytime is thus carried to different holder-stations in the City. The holders are about 1½ million feet capacity each, but only a portion of those contemplated are erected. The capacity of the 48-inch mains is reached, and it is proposed to establish a pumping-station, about three miles from the works, to increase the flow until such time as a 6-foot wrought-iron main may be laid.

At several of the other stations of the Chartered Company very large works may be found, sending out six, eight, nine millions a day. Some very large holders, of two millions capacity, are in successful operation; but when we compare the enormous business done, with that required of our works, the large holders are not so much out of proportion. Our Engineer told me he had seen one of his holders, containing 1½ millions, emptied in 1½ hours.

At the Fulham, and at St. Pancras stations, settings of ten brick retorts are in use. Some benches that had been in use for twelve years were still working and doing good service. The settings of tens, worked from a travelling stage, were necessitated by want of space; but I think otherwise were not found so economical as sixes or sevens.

The Chartered Company last year carbonized, at all their stations, 1,051,323 tons of coal, made 10,728 million feet of gas, and sold 9935 millions, or the make per ton was 10,205 cubic feet, and the sale 9540 cubic feet.

Each of the different stations is under the direction of an Engineer who resides at the works. This is the usual practice throughout England, although it is not always the case.

The next largest Company, in amount of coal carbonized and gas made, is the Phœnix, which last year carbonized 163,478 tons of coal, made 1652 million feet of gas, and sold 1539 millions.

The Manager of this Company is Mr. Corbet Woodall, the late President of the British Association of Gas Managers, and under his direction the largest holder in the world is being constructed. It is 213 feet in diameter, telescopic, two lifts, of 44 feet each, and will hold 3,100,000 cubic feet. This Company has three manufacturing and holder stations.

Time and space do not permit the giving of many details connected with these and other works; but I will mention the South Metropolitan as being remarkable for selling the cheapest gas in London, the price last year being 3s. 2d., equal to 77 cents., per 1000 feet. The other Companies sell at prices varying from 3s. 3d. to 4s. The more general price is 3s. 6d., or about 87 cents., per 1000 feet. The London Company have recently been introducing improvements in the handling of their coal. Heretofore, all the coal coming to the city was discharged from vessels into barges, below the bridges, and then floated up with the tide to the point where wanted. The London Company have had some large steamers constructed, with falling smoke-stacks, &c., which pass up under the bridges to the Company's dock, near the works, where they are unloaded by hydraulic cranes, and the coal run by rail into the works. The appearance of large steamers above the bridges was a novelty.

To give a general idea of the workings of the London Companies, I propose to treat them as a whole, and from published reports I have taken certain statistics, and taken the averages of all the six Metropolitan Companies for five years. For general comparison with what you may be doing yourselves, this may answer quite well enough. In converting sterling into currency, for convenience of calculation, I shall call the shilling 24 cents and the penny 2 cents.

Items of Cost, &c., per 1000 *Feet of Gas Sold, as shown by the Averages of all the Six Metropolitan Companies of London for the past Five Years:—*

1. The amount of capital employed per 1000 cubic feet of gas sold was 14s. 4d. =	3·40 dols.
2. Price of gas per 1000 cubic feet, 3s. 11½d. =	95·00 cents.
3. Cost of coal per 1000 cubic feet of gas sold, 26·74d. =	53·48 cents.
4. Working expenses per 1000 cubic feet of gas sold, which includes purification, salaries, carbonizing, wages, wear and tear, distribution, rent and taxes, management, law charges, bad debts, &c., 18·18d. =	36·36 cents.
5. Residuals per 1000 cubic feet of gas sold, 15·09d. =	30·18 cents.
6. Gas sold per ton of coal carbonized	9035 cubic ft.
7. Gas unaccounted for, per cent. on make (4 years)	7·07
8. Bad debts, per cent. on gas and meter rentals.	0·52
9. Net proceeds of residuals, per cent. on cost of coal	56·19
10. Profit on gas, per 1000 cubic feet sold, 15·48d. =	30·96 cents.
11. Net profit per 1000 cubic feet gas sold, 13·93d. =	27·86 cents.
12. Dividend (standard) per 1000 cubic feet sold, 13·43d. =	26·86 cents.
Per cent. on capital, about.	7·8

Recapitulation.

Cost of coal per 1000 cubic feet of gas sold	53·48 cents.
Working expenses	36·36 cents.
	89·94 cents.
Less residuals	30·18 cents.
Cost of gas less residuals	59·76 cents.

Price of Labour.

The average price of labour has been—

In London, 1878.	Dols. cents.	In New York, 1873–78.	Dols. cents.
Stokers	1 32	Firemen	3 12½
Labourers	0 96	Helpers	2 54
Bricklayers	1 44	Bricklayers	3 12½
Carpenters	1 44	Carpenters	3 46
Blacksmiths	1 32	Blacksmiths	3 37½
Fitters	1 36		
Service layers	1 20		
Lamplighters	0 72		

	Dols. cents.
Average cost of coal per ton in London, 53·48 × 9035	4 83
Average cost in New York for five years—	
Cannel	11 63
Caking	6 54
Province	5 16

From these figures (which are official) each one of you can calculate the relative cost of your own gas delivered and that in London; and, although I am not able to speak from actual knowledge in any one case, much less than in a general way for a series of years, still I am under the impression that, when due allowance is made for difference in cost of coal and labour, and the difference in the receipts for residuals, it will be found that gas is made as cheaply (in proportion) here as in London. I may

be wrong in this; and, if so, I am ready to be corrected. These are points that we need carefully collated statistics upon, which, unfortunately, we have not got. I hope this Association may soon have sufficient confidence in itself to begin the collection of such data.

A few words as to the working parts of the system of gas making in London.

The general cleanliness of the works was fair, but in many cases much more attention seemed to have been paid to the appearance of the engine and exhauster rooms than to other parts of the works. At some of the stations these parts of the works were a perfect delight to look upon, and one felt loth to leave them; while justice compels me to admit that at other works, these and every other part were in such an untidy condition as I trust would be seldom seen here—or if seen here at all they should not be commended by any gas manager.

As to gas purification in London, it is simply absurd. The Manager has, in fact, very little time to do anything but watch his purification. The restrictions, in some cases as hard as 15 grains of sulphur in 100 cubic feet, are simply absurd. In lighting the gas through a house with our ordinary sulphur matches, more sulphur would be set free than from 100 feet of gas with twice this amount.

The extent to which the sulphur question is carried there seems like a refinement of science rather than a useful, practical protection of the public. The Cas Companies are tied down to the extremest limits on grounds of public health, while thousands of houses are annually flooded with high tides, heavy rains, &c., which sweep into permanent lodging-places, within the habitations of the poor, the refuse—sometimes even the back-water—from sewers and drains; all of which results from imperfect provision for taking care of this kind of impurity by the same Authorities who hold up their hands in holy horror and exact a fine of £50 from the unhappy Gas Companies every time they can find "an excess of sulphur."

A very singular fact exists with reference to the sulphur impurities. The moment a City or Municipal Corporation acquire the possession of gas-works in England, all these restrictions disappear, and are no more spoken of. Bearing in mind the continued anxiety of the London Manager on the purity question, and that in some cases test-analyses are made every hour, it is not strange if the details of the retort-house received less attention. I think that with us the motto is, "In the retort-house is where the money is made;" or, perhaps more justly, it may be said, "the retort-house is where the money is *saved*." It did not appear to me that there was as much economy there as with us.

The charges are all "six hours;" the retorts are all "throughs." In several works 20 men did the work for 96 through retorts, 192 mouthpieces, in twelve hours, or 4·8 retorts per man for 24 hours. This includes drawing and charging, and quenching coke and throwing it back in the cellar. But the coal is in coal houses alongside the retort-houses, and has merely to be picked up and put into the retorts. There is no bringing coal or hauling out coke in this estimate, for it does not have to be done. The coal is there, and the coke goes into the cellar.

The buildings of some of the more recently constructed works are very handsome and substantial structures, wherein beauty of architectural design has been combined with practical utility. Against this most commendable practice there are not wanting those who complain that if the Companies did not spend so much money on buildings they would not have to pay dividends on so large a capital, and, consequently, they could sell gas cheaper. This, too, from a people who get good 15-candle gas for 87 cents per 1000 feet, and do not burn it in any place where they can avoid it in their houses. Truly, it is somewhat difficult to please the ordinary gas consumers.

The use of gas in dwellings is usually restricted to the lower parts of the house; and, either in hotels or private houses as you mount the stairs to retire, you are often confronted with a table filled with brightly polished candle-sticks, containing the "one candle power" that is to enable you to complete your correspondence, read your Bible, and see you into bed.

In this fact (which must some day cease to be a fact), as well as the natural increase of population, and the steadily increasing application of gas to heating, cooking, and mechanical purposes, is to be found the cause for the steady and rapid increase in "gas sold," that is found in London. This, I believe, will continue to be the case: and neither will the "electric light," nor petroleum, convert the now busy places, where gas-works stand, into vacant lots or grass-grown wastes waiting other occupants.

Mr. NEAL: Do you mean to be understood that the price at which gas is sold here is cheaper, in proportion, than the price charged in London?

Major DRESSER: That is a point that I do not wish to be misunderstood about. I tried to word that phrase very carefully. I said, "I am under the impression that, when due allowance is made in the cost of coal and labour, and the difference in receipts for residuals, it will be found that gas is made as cheaply, in proportion, here as in London." My object in collecting these figures has been to get reliable information, and put it before you, so that each man can take the items and calculate for himself, and see exactly where he stands, in comparison with London makers. There is one thing I omitted to say, and that is, that the statistics I gave here were for the entire five years. It is interesting to note what the improvement has been in carbonizing during that period. Taking the results which I have summarized, we have the following figures:—Amount of gas sold per ton of coal carbonized for 1873, 8575 cubic feet; for 1877 the amount of gas sold per ton of coal carbonized was 9333 cubic feet. These figures show that they are not standing still on the other side any more than we are.

Mr. GREENOUGH: It is not my intention to endeavour to add anything to the paper which Major Dresser has read, and which has been listened to with so much interest. But there is one point which, although he touched upon it, is worthy, I think, of a little closer attention. Comparing the price of gas in London and in this country, a very important question comes up, that was hardly dwelt upon sufficiently in his paper, and that is the interest on capital.

Major DRESSER: I gave the amount of capital invested in London per 1000 feet of gas sold—3 dols. 40 cents—from which every man can calculate for himself.

Mr. GREENOUGH: That is true, but at the same time its importance was hardly made sufficiently prominent. I had the pleasure this summer of hearing Mr. Livesey read a paper upon the proportion which the amount of capital invested in Gas Companies should bear to the amount of coal carbonized. Taking a large number of English Companies, the conclusion he arrived at was that any well-ordered and economically-directed Company ought not to have a capital of more than £5 per ton of coal annually carbonized. I do not believe there are any Companies in this country who can show such figures as that. Taking our own Company, for example, who, I think, do a large business, the relation of capital invested to the amount of coal carbonized would be about £10 per ton. That, as everybody can see, is a very large matter, having a material influence upon the cost of gas in this country. I do not know that it is necessary for me to add my opinion to what Major Dresser has said in the way of comparison between the efficiency of our works on this side of the water, and the works upon the other side; but I think he is entirely justified in every comparison he has drawn between their retort-house works and our own. The engineering arrangements of the works in England are on a much larger scale than those in this country, and the quantities of coal to be handled are very much greater. The process by which hand-power is saved, the coal distributed, and purification carried on, is such as to call forth the admiration of everybody who sees it. But when you go into the retort-house, you are surprised to find that people who are so careful at the spigot are wasting so much at the bung-hole. I think the greatest mistake our friends on the other side make is in giving so much more attention to purification than to the retort-house, where, as Major Dresser says, our money is saved. I will simply mention one fact in this connection, which I think the members of the Association will appreciate at once. At one of the large works which I visited, the hydraulic main, which we are in the habit of watching pretty carefully in this country, was set on brick piers, built on the benches, and, of course, the main had settled or lifted with the bed, and the consequence was they had a heavy seal on some dip-pipes, while others would have very little. I think that will fully serve as an illustration of what I mean. I have taken the liberty of saying these things, thinking they might be of interest to the Association; but having opened my mouth on the subject, I do not want to sit down without expressing, in the strongest language, my appreciation of the hospitality with which we, as Americans, were received in London this summer. I had the pleasure of being with Major Dresser and Mr. Forstall, of New Orleans, and there was nothing which the people among whom we went could have done that they did not do to make our reception of the most cordial and friendly nature. They extended to us every hospitality; they showed us round their works, and gave us all the information they could; they invited us to their homes, and they evinced the highest degree of interest in everything that was being done on this side of the water. And I have no doubt but that any gentleman of this Association, who went there properly indorsed, would receive the same kind of welcome which was extended to us, and which made so great an impression upon us.

Mr. NEAL: I understand that Mr. Forstall, who was with Major Dresser and Mr. Greenough on their trip abroad, spent a great deal of time in the examination of the Paris Gas-Works. He is prevented from being with us to-day by the ravages of the yellow fever. I understand that he has prepared, or was to have prepared, a very interesting paper upon the subject, to be read to us; and perhaps, in this connection, it would be well for Major Dresser or Mr. Greenough, in the absence of Mr. Forstall, to give us some account of the Paris works.

Mr. GREENOUGH: In reference to the Paris works, I would simply say that Mr. Forstall was in Paris very much longer than I was, and he devoted much more study and attention than I did to the Paris Gas-Works. I understood that he was to prepare a paper on that subject to present to this meeting. The number of gas-works I visited in Paris was very few indeed. My principal object, while in the French capital, was to familiarize myself, as much as possible, with the working of the electric light, and not in any way to bestow careful attention upon the details of gas manufacture. I was at only two or three works, and made but a very cursory examination of them. The necessity of utilizing their coke is so much greater than it is with us, and it is so much more important for them to save every pound of it that they can, that they have devised, as you all know, the most ingenious plan for saving it, and at the same time obtaining very high heats. The average temperature of their retorts was 1350° Cent., or 2500° Fahr. Their retorts are 25 by 10 by 9 feet, and they are charged every four hours with about 270 lbs. of coal. Their works present a singular contrast to the London gas-works; and the impression which was left on the English engineers who visited Paris in company with us was very great, especially when they found that in the works which we visited they had 1100 retorts, and were making about 8000 feet from each one of them, and that, too, with the use of only about 25 per cent. of coke as fuel; and I think that in the works where they were using either the Siemens furnace, or another similar one that was arranged by themselves, they saved about a quarter of that 25 per cent. The utilization of the residuals—coke, ammonia, &c.—is so much of an object to them, that the Chief Engineer of the Paris Gas Company—M. Arson—told me that his residuals paid him not only for the manufacture of his gas, but also for a very considerable portion of the cost of distribution. That is a result, the bringing about of which, I think, we should hail with enthusiasm in this country. The impression left on my mind, after visiting the works in Paris and in London, was that if we were to take the French retort-house and the English purifying apparatus, and run them in conjunction, we should have a pretty nearly perfect set of works. At the works at La Villette, the arrangements for purification were singularly simple and small as compared with those of the London Companies. It is in my recollection that the only purification to which the gas was subjected was that of oxide of iron. Charging, as they do, their retorts every four hours, instead of every six, as the English do, it was contended by the French engineers, and, I must say, I think with entire correctness, that the amount of bisulphide of carbon was very much less in the French gas than in the English. That assertion was at once contradicted by the English engineers who were present; but it is my impression, notwithstanding, that the Frenchmen were perfectly right. I have very little to say on the subject of these French Gas Companies. With the relation of the Parisian Companies with the public, I suppose, you are all familiar. It simply amounts to this, that the Parisian Company, in 1853 or 1854, contracted to supply Paris with gas for 50 years. They sell to consumers at a price equal to about 1 dol. 75 cents per 1000 feet, and they supply the street-lamps at half that price, I think. They are allowed to pay 10 per cent. dividends to their stockholders, to provide for a sinking-fund, with which their stocks shall eventually be redeemed, and also to provide for all repairs that are necessary; and then any extra money which they earn beyond that, they are required to divide equally with the city of Paris. That, of course, gives the city the interest of a partner in the Company. The amount of money which was paid to the city of Paris last year by the Company was, I think, 8,500,000 francs, which a little more than paid for the gas they burned. You thus see that they made some money by the operation.

Major DRESSER: They paid for the gas they burned at about the rate of 87 cents per 1000 cubic feet; then what they got from the division of profits, over and above the authorized dividends of the Company, a little more than paid for the gas they used. So that, under such a condition of things, it will be seen that it is to the interest of the city to burn as much gas as possible. The more gas they burn, the more money they make.

Mr. GREENOUGH: One thing I had forgotten to say, and that is, they not only work up their coal tar and ammonia water into ordinary products, but they also produce a species of fuel, which is extensively sold throughout the country at very great profit, as I understand. Using their coke dust, and, I think, their coal dust, and mixing with it the residuals of their tar stills, they produce blocks of this compound, which are perhaps about 12 inches square. These they sell to railroad companies for fuel. They are very easily stored on the tenders of engines, and you will see them in piles of thousands of tons around the large railroad stations in the vicinity of Paris. We had the pleasure of being present at a luncheon which was given to the Société Technique, and also to the British Association of Gas Managers. The tables were spread in the new retort-house belonging to the Paris Company at Ivry. I think the gentlemen who were present were very much surprised to see the wonderfully beautiful trophy which was

there exhibited. It was on the brick wall at the end of the building. The extraordinary construction of it you would never notice until you came to pick it to pieces and see what it was composed of—rakes, stand-pipe augurs, shovels, &c. I should like to say, in this connection, that the hospitality with which we were received in England was fully equalled by our reception at Paris. Nothing could exceed the courtesy and cordiality with which we were treated. I might say a good deal about the electric light, but you will hear enough of that.

Mr. PRICE: It has been said that they manufacture all their material.

Mr. GREENOUGH: They manufacture their retorts and fire-bricks, not only for their own use, but for works at other places. They also sell some retorts.

Major DRESSER: They make everything that they use. They make their own holders, their own fire-bricks, &c.; and not only that, but they make gas-stoves and gas-engines, and anything that will increase the use of gas.

Mr. M'ILHENNY: So much has been said by the gentlemen who have just spoken in regard to the manner in which they were received across the water, that I am tempted to say a few words upon that subject. I visited Europe three years ago, and it is perhaps very ungracious for me to tell about the cool reception that I met with over there—in fact, no reception at all. They let me severely alone, and I could not account for it; but since Major Dresser has come back it has all been made clear. He says that he was told by the people over there that there was a gentleman visited them by my name, but they thought that he would not live to get back home. I think, perhaps, the lack of attention on their part towards myself was due to the fact that they were afraid I should die on their hands, and they did not want a first-class corpse over there.

Captain W. H. WHITE: I do not think it is necessary to again inflict upon this Association a narration of my experience upon the other side. It was certainly very pleasant. I was received with the greatest courtesy and cordiality wherever I went, and I am at a loss to understand why it was that Mr. M'Ilhenny was so coolly received. He accounts for it upon the theory that they thought he might possibly die on their hands. I do not look at it in that way. They probably thought that if he did die on their hands, it would take all the good whisky in England to preserve his body and send him home, and for that reason they were anxious to get him out of the country while he was yet alive.

Mr. DENNISTON: I should like to call attention to one thing suggested by the remarks we have listened to. I think we all ought to try and get the consumers interested in the prosperity of the companies. I have tried to do that by charging them 2 dols. 50 cents per 1000 feet for gas, and giving them 20 per cent. off; so that, as Major Dresser has stated regarding the city of Paris, the more gas they burn, the more per centage they get off. I think it is a first-rate idea to give them some such inducement to burn more gas.

The continuation of the discussion on Major Dresser's paper will be given next week.

ON THE UTILIZATION OF TOWN SEWAGE.

By Lord NORTON, K.C.M.G.

[A Paper read before the Social Science Congress, Cheltenham, 1878.]

Sewage is intended to refertilize land. In country houses and cottages, each dwelling should be able to utilize its own. Why should it waste such wealth of its own to the injury of others? To use your own without injuring others is a first rule, and why should anybody waste capital at all, especially poor people, even paupers included? In Belgium this sort of produce is estimated per head, and sold. I had a farmer who boasted of the good situation of his farm premises, because they drained easily into a river. Towns which still boast the same would have called him a fool. The sewage of very large towns presents a difficulty how to distribute such vast collections over sufficient space. That is the only difficulty—the disposal, *i.e.*, the putting out to undoubted enormous profit, of an awkwardly accumulated capital. Sufficient space within reach, or carriage to a distance, are the objects difficult to be attained. The first Acts of Parliament led towns into a great mistake—and this is their only excuse for the consequent nuisance—and large outlay was inflicted upon them, which now must be a good deal thrown away. They were invited to take up loans of large amounts to make discharge of sewage into running water, or the sea. My own case against Birmingham is the leading precedent for an injunction against such a nuisance. Attempts have since been made by towns to utilize the sewers already made, into which the rain and street washings also entered, for collection of the whole drainage into tanks, from which the sewage might be variously disposed of, as little as possible escaping into rivers. It is curious to study the various attempts which have been made to convert sewage into cement, or anything but its natural use, or so as at least to conceal it, but never to make any profit out of it. The truth always comes out that application to land is the true and only right disposal of sewage. It also has been made to appear from those attempts, if properly so distributed, how enormously profitable sewage is, and perfectly preventible from creating nuisance. It has even been shown for the first time what enormous produce may be obtained from land. I have some statistics of the produce of the sewage farm at Saltley, in the hands of the Corporation of Birmingham, given me by Alderman Avery, than whom no man has given more enlightened and energetic attention to the subject. In 1877, 78 bushels per acre of black oats were produced, besides 2 tons of straw; 60 tons per acre of mangold; 4 tons of hay, besides feeding off the same land; 40 tons of rye-grass per acre in 5 crops, besides grazing after the fifth mowing; 2½ gallons of milk daily from cows. The return for 1878 has been in every item still larger; for instance, 120 bushels per acre of black oats. One has heard how security of tenure, even for a short lease of 21 years, draws out a Scotch tenant's investment of capital in his landlord's land; but here we find that even the double produce so obtained—in comparison with English farming on tenure at will—is distanced by the produce of unlimited investment under pressure of necessity. It is scarcely possible to punish land, if it is used not as an English farmer uses it—with parsimonious abstinence, but as a manufacturer uses his investments—for the largest and most rapid turn of capital. On this Saltley farm the sewage of Birmingham is vomited out from the sluices, and dug in and in from time to time, so as to saturate a perpetually turned-up soil. What is wanted for the effectual, profitable, and innocuous disposal of the greatest collection of sewage in the largest towns is sufficient land, and separation of sewage into drains by itself—chiefly the latter, which would greatly economize the former. Birminghan has nearly 400,000 inhabitants and a sewage farm of only 200 or 300 acres. All the sewage that passes through land comes out apparently clear and innocuous into a river, after producing the above described enormous crops. But a great deal has to go into the river from subsiding-tanks, without passing through land, and, above all, whenever a storm comes the overflow from tanks is enormous, washing accumulations of filth into the river, almost as fatally to man and beast all down the valley as if there were no interception of sewage at all. What, therefore, is now the chief remaining step to be taken to make the remedy for this great nuisance complete is the separation of storm water from the sewage, except so far as may be necessary to flush the drains. Naturally, the towns are very reluctant so to throw, to a great extent, their first outlay on their main sewer, and to incur fresh expense in this proposed separation. But I hope, when they actively reflect how much more it would cost to buy sufficient land to dispose of wastefully diluted sewage, how much more disposable and profitable the undiluted sewage would be, and what a rescue from litigation would be their happy exchange for a whole neighbourhood in constant irritation from nuisance round them, they may resolve to take this last step, and completely solve a great national matter. If they will not, Parliament must again interfere.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

A fair amount of business for the time of year has been doing in the better classes of round coal, and the pits generally are working more regularly, with prices firm at late rates. The improvement, however, does not extend beyond this, all other descriptions of fuel being very difficult to sell. Gas manufacturers are taking their deliveries of gas coals on account of contracts very well, but in the market there are no inquiries of any importance for fresh contracts, and prices nominally are the same as those ruling during the summer. Common coal for iron-making and steam purposes meets with no better demand, and continues very low in price, whilst engine classes of fuel are more a drug than ever, and exhibit a downward tendency in value, slack especially being offered at very low figures. The average quotations at the pit mouth may be given about as under:—Best coal, 9s. to 9s. 6d.; seconds, 7s. to 8s.; common house coal, about 6s.; screened gas coal, about 6s. 6d; steam and forge coal, 5s. to 5s. 6d.; good ordinary burgy, 4s. to 4s. 6d.; good ordinary slack, 2s. 6d. to 3s. 6d.; with the common sorts offering at 2s. per ton.

The demand for Lancashire cokes continues very small, in consequence of the depression in the iron trade, and the output from the ovens is nothing like the average production, whilst prices are very low; best Lancashire cokes at the ovens being quoted at 17s., and common qualities at about 11s. per ton.

The iron trade continues extremely dull. Very few orders for either pig or manufactured iron are being given out, and until the turn of the year it is scarcely probable that any purchases of importance will be made by consumers. Prices are generally weak, for although makers quote late rates, they would, as a rule, be open to offers if buyers had good orders to place.

A general movement for a reduction of wages in the iron trade of this district has been commenced, and notices for a reduction of 4s. per week have been given in the boiler-making branch. In some cases there are signs of opposition to the reduction; but with so many men out of employment in the district, there is little doubt the masters will be able to enforce their own terms.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The shipments of gas coals continue to be above the average. Sailing ships took cargoes away last week to the bye-ports in the South, having been freighted by the Gas Companies direct. Steamers have also loaded gas coals pretty considerably. The demand is for best qualities. Second-class gas coals are not so much inquired after. Some of the pays of collieries of that description have not been large. Steamers have been freighted for Dublin to carry gas coals, and other boats have been taken up for the same trade to the West of Ireland. Arrangements have been made for shipping north country gas coals at moderate rates to the nearer ports of Europe. Winter weather steamers have been engaged to carry gas coals to Rouen at 7s. 6d. per ton for twelve months. A good few of the cargoes will be transhipped into lighters, and taken on to Paris for the Gas Company there. Gas coals are also being shipped to the Adriatic. Business in this trade is likely to be pretty steady over the next two months. There is a good demand for house coals. The demand for the better qualities of steam coal is a little stronger than was at one time anticipated.

In the freight market coasting rates kept firm last week. From 5s. 3d. to 5s. 6d. was paid steamers to load coals for London. A boat for four voyages, 4s. 9d. Sailing ships have been chartered to load coals for London at 6s. 1½d., 6s. 3d., and 6s. 6d. per ton respectively. The rate stood 6s. 6d. on Saturday. As the fleet of sailing ships had got to sea, and the few which were on offer had the command of the market, this is likely to be paid. The Channel rates for sailing ships are from 8s. 3d. to 8s. 6d. per ton. East coast, 5s. 3d. to 5s. 9d.

The general manufacturing trade of the North of England is little changed. A better business has been done in chemicals to the United States of America, but at low rates. The chemical trade to the Continent is extremely quiet. The iron trade of the Cleveland district shows no improvement, and there is not much inquiry for fire-clay and similar classes of goods. Some rather large parcels of lead have arrived in the Tyne this week from Spain. The lead market is very depressed.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

Mr. Andrew Scott, Assistant Manager of the Galashiels Gas-Works, has been appointed Manager of the Falkirk Gas-Works. Considering the quantity of gas required within the town, the works and mains are much too small; but it is understood that the new proprietors of the works intend, in the spring of next year, to lay down large mains, and to make such alterations and extensions of the works as are required by the large demand for gas. They also propose to make a considerable reduction in the price of gas. In the meantime, they have to work up the contracts entered into by the late proprietors for gas-producing materials. The consumers of gas in Falkirk look forward with much interest to the competition of the two Companies, both of which ought to be able to reduce the price of gas, and still make a fair return on the money invested, providing, of course, that the works are properly managed. The gentleman whose appointment has been mentioned above is the son of Mr. Alexander Scott, who has for years had the distinguished honour of manufacturing the cheapest gas in Scotland.

A meeting of the Police Commissioners of the burgh of Lockerbie, as reconstituted at the recent election, was held on the 28th ult., when it was unanimously agreed to approve of the resolution come to at a meeting of the Commissioners held on the 1st of October, that the Burghs Gas Supply (Scotland) Act, 1876, be adopted in, and applied to the town.

On the occasion of the annual meeting of the Lochore and Capeldrae Coal Company, Limited, which was held in Edinburgh last Friday week, Mr. H. Aitken, Chairman of the Company, delivered himself of some interesting remarks on the question of Gaslight *versus* Electric Light. Referring to the disturbing influences encountered by the Company, he said that one of them had been the electric light. He had made himself familiar with all that had been published on the subject, and, so far as he had been able to judge, the Shareholders need not fear that it would injure the Company to any extent; indeed, he was one of those who thought it would prove to be an advantage—in this way, that it would cause people

to make better gas, and to make better gas they would need better coal, and he thought it would cause a demand for first-class cannels. The electric light would work itself into certain positions where there was large traffic—in public streets, and also, perhaps, in railway stations and factories. He did not think it would ever materially injure the gas manufacture, and if they believed those who had studied it from a professional point of view—doctors and oculists—they seemed to be of but one opinion, and that was that it would be a most injurious thing for the eyes. Altogether, as far as their present knowledge went, they had nothing to fear from the electric light.

On the recommendation of the Corporation Gas Committee of Renfrew, the Town Council have resolved to reduce the price of gas from 5s. to 4s. 7d. per 1000 cubic feet, the reduction to take effect from the 1st of January next.

At the usual monthly meeting, on Monday, the 2nd inst., the Town Council of Burntisland resolved to proceed with the transfer of the gas-works from the North British Railway Company to the burgh, the price to be fixed by arbitration.

The annual general meeting of the Inverkeithing Gas Company was held last Tuesday, when a dividend of 5 per cent. was declared. It was agreed to continue the price of gas at 8s. 4d. per 1000 feet.

A considerable degree of interest is being excited throughout Scotland in favour of the gas-engine as a motive power. It is not necessary to enlarge upon the subject at the present time, but it is worthy of mention that a report comes from Dundee to the effect that one has been in use on the premises of a sack-sewing firm in that town during the past four months, and was worked as silently and smoothly as a steam-engine. While it is capable of developing 3½-horse power, its average consumption of gas is only 39 cubic feet per hour, or 2184 cubic feet per week, the cost for gas being thus about 8s. 6d. for that period.

Glasgow Corporation 6¾ per cent. Gas Annuities, which were quoted at £152 on Saturday week, fell to £150 on the following Monday, at which price they remained during most of the week. Business was done in the 9 per cent. Annuities on Wednesday at £201, and on Friday at a decline of £1, both in Glasgow and Edinburgh. On Monday, the 2nd inst., the price of the Edinburgh Gas Company's shares stood at £43, and on Tuesday buyers were offering £45, but sellers were unwilling to part with them at less than £49. The Edinburgh and Leith Gas Company's stock sold on Friday at £29.

At a meeting of the Works Committee of the Dundee Gas Commissioners, held yesterday week, a sub-committee was empowered to expend a sum not exceeding £300 in the purchase of apparatus for experiments with the electric light. It was remarked at the same meeting, by the Provost, that the Gas Committee were of opinion that by getting the gas-engine (referred to in another "Note"), and showing it at work, they would be doing a good thing to promote the sale of gas.

The proposal to introduce the electric light into Edinburgh has at last assumed definite shape, and possibly by the 21st inst. the Waverley Market will be lighted by its means. At a meeting of the Lord Provost's Committee of the Edinburgh Town Council, on Friday, permission was given to fit up the necessary apparatus for producing of the electric light in the west corner of the Waverley Market. Arrangements are accordingly in progress for having the Rapieff electric light produced. Two of Gramme's dynamo-electric machines will be used, and the light produced under the personal superintendence of M. Rapieff.

Mr. N. J. Holmes, of London, who is well known for his labours in the early history of the electric light as applied to lighthouse illumination, and for his intimate intercourse with Professor Faraday in his investigations, delivered a public lecture, on Friday evening, in Dunfermline, on "Modern Inventions," in the course of which he spoke of the electric light, and said it was great folly, in those who were interested in gas companies, to have any alarm on account of the recent inventions. As it at present stood, the electric light could never supersede gas in domestic lighting, on account of the expense and trouble which would be connected with it. The gas light was always the same; but the electric light was continually varying, and was liable to go out if not attended to.

The Inverness Police Commissioners are at loggerheads amongst themselves in regard both to the financial management of the gas and water supply undertakings since they were handed over to the Municipal Authorities, and to the mode in which their borrowing powers should be increased. Without waiting for the authority of a meeting of the Police Commission, some of the executive officers of that body have given notice of a Bill to be promoted in the ensuing session of Parliament, but a movement has arisen in favour of dropping the Bill, and applying for a Provisional Order to accomplish the purpose aimed at. The case of the action recently taken by the Municipal Authorities of Paisley has been cited as a sufficiently good precedent.

At a meeting of the Works Committee of the Dundee Water Commissioners, held last Thursday week, it was reported that the agreement between the Commissioners and the Newport authorities for the Newport water supply, *viâ* the Tay Bridge, had been concluded, and that the pipes for carrying out the works had been ordered. It was also reported that the pipes for the fuller supply of Broughty Ferry were being laid along the route.

A Provisional Order is being applied for by the Parochial Board of the parish of Bothwell, as the Local Authority, for powers to carry out a water supply scheme for the important residential and mining villages of Bothwell, Uddington, Bellshill, and Mossend, and the lands adjacent thereto. The proposed gathering-ground and site of the required reservoir are in the parish of Lesmahagow; Messrs. J. and A. Leslie, Edinburgh, are the Engineers. As the main supply-pipes are to pass through Larkhall, the inhabitants of that very important mining village are moving in favour of the scheme, with the view of sharing in its benefits.

Messrs. J. and A. Leslie, C.E., Edinburgh, have recently devised a gravitation water supply scheme for Bridge of Weir, an important manufacturing village in Renfrewshire. The adoption of such a scheme cannot well be delayed, as there is a rapid increase in the population.

At a meeting of the Irvine Water Commissioners, held last Thursday, it was agreed to request the Engineers, Messrs. Leslie, to see that the leakage at the works was put right; and the Clerk announced that, as nearly as he could calculate, the new water-works would cost about £40,000, requiring an annual payment, for money borrowed and for working expenses, of £2166 13s. 4d. The Committee recommended that an assessment of 2s. per pound of rental be levied, one-half on the tenants and the other half on the proprietors.

The Hawick Town Council have applied to the Public Works Loan Commissioners for a loan of £19,000—for the proposed water-works, £15,000; and for the sewerage works, £4000.

Last week's Glasgow pig iron warrant market was firmer, and a very large amount of business was done every day. Prices advanced from 42s. 7d. on Monday to 43s. 1½d., cash, on Friday. There is a stronger desire now manifested to invest in warrants.

No change of any importance has arisen in the local coal market; but there has been a slightly better demand for house coal, though not at all sufficient to carry off the present large outputs.

Reduction in the Price of Gas at Ryde.—The Ryde Gas Company have announced their intention to reduce the price of gas to 4s. 6d. per 1000 feet, after the Christmas quarter.

Institution of Civil Engineers.—At the meeting of the Institution on Tuesday last, Mr. James Abernethy, Vice-President, in the chair, the first ballot of the session resulted in the election of twelve members, among whom was Mr. Alfred Penny, jun., Ex. Eng., P.W.D., Bengal.

Reduction in the Price of Gas at Pontefract.—The Pontefract Gas Company announce that, on and after the 1st of January next, the price of gas to private consumers will be reduced 8d. per 1000 cubic feet, the present price being 4s. 2d.

Sale of Gas Shares at Barnsley.—Last Wednesday some stock and shares in the Barnsley Gas Company were sold by auction, with the following results:—The first lot was £177 14s. Original Stock, 10 per cent., which was purchased for £300. The next lot, five C shares (£10), 6 per cent., was purchased for £11 per share, or £55. Nine D shares (£10), 7 per cent., realized £12 7s. 6d. per share, or £111 7s. 6d. The last lot was five E shares (£10), 7 per cent., which were purchased at £12 5s. per share, or £61 5s.

Eckington Gas Company.—The nineteenth annual meeting of this Company was held last Wednesday—Mr. F. Barber in the chair—when the report read showed the Company to be in a fair position. The amount available for dividend this year was £513 15s. 7½d., out of which the Directors recommended that £100 should go to the reserve-fund, and that a dividend of 1s. 4d. per £1 share be paid, which would absorb about £400. The report was adopted. Messrs. J. Jervis and T. G. Hawkins were re-elected auditors for the ensuing year; and Messrs. Wells, Widowson, Fanshawe, and Keeton, Directors.

Quality of the Gas at Ayr.—We understand that at the request of the Lighting Committee of the Ayr Town Council, Dr. Wallace, of Glasgow, visited the Ayr Gas-Works on Friday, the 22nd ult., along with four of the members of the Committee, to test the gas by means of the photometer at the works—the apparatus belonging to the Corporation not being in a state to be used. No previous notice had been sent to Mr. Robb, the Gas Manager, of the visit. Dr. Wallace found the quality of the gas to be equal to 26 candles (the Company being only bound to supply gas equal to 24 candles), and he pronounced it to be very good gas.

Sale of Gas Shares at Croydon.—Last Thursday there were sold by auction a number of shares in the Croydon Commercial Gas Company, which, although they did not fetch the price obtained at a recent sale at the same place, realized sums sufficient to show that the electric light has not yet had the effect of very much depreciating gas property. Sixty-three original shares of £5 each, on which the present dividend is 11½ per cent., were put up to auction, and those sold realized £10 per share; while nine shares of the B 1876 capital, £5 paid up, fetched £64—a trifle over £7 each. The dividend on the latter shares is at present 8½ per cent. per annum.

Windhill Water Supply.—Last Wednesday, Mr. Arnold Taylor, one of the Inspectors of the Local Government Board, held an inquiry consequent on the application of the Windhill Local Board for powers to borrow £2950, which is required for laying water-mains partly in Windhill and partly in the Shipley district. Since 1857 the district of the Windhill Local Board has been supplied from the Shipley reservoirs at the rate of 6d. per 1000 gallons. That lease having now expired, a new arrangement has been entered into, with the Bradford Corporation, for a supply of water for 14 years at 9d. per 1000 gallons, in consequence of the Shipley Board not being able to supply the whole of the additional area acquired under a Provisional Order obtained in 1875. Mr. W. B. Woodhead, Engineer to the Board, adduced evidence in support of the application, and there was no opposition.

Frome Water Supply.—On Thursday, the 14th ult., an inquiry was held at Frome by Arnold Taylor, Esq., one of the Inspectors of the Local Government Board, upon the application of the Frome Local Board, for sanction to borrow £14,000 for the proposed water-works for the town. Evidence upon the subject was given by Dr. Parsons, the Medical Officer of Health, and by Mr. Henry Tomlison, C.E., the Engineer; and the Inspector afterwards visited the suggested site of the works. On Monday, the 25th ult., at the meeting of the Local Board, a letter was read from the Local Government Board, sanctioning the borrowing of the £14,000 requisite for carrying out the proposed scheme; also for an immediate loan of £1000 to pay the Earl of Cork for certain land and water rights. It was resolved that the Earl's offer of 2½ acres of land, and the right to search for and take water, for £1000, be accepted; and that the Public Works Loan Commissioners be applied to for a loan of £14,000 for the purpose of providing the works.

Opening of New Water-Works at Chipping Norton.—The water-works recently constructed by the Corporation of Chipping Norton, Oxon, were formally opened by the Mayor on Thursday last. The new supply of water is derived from the oolite, at the outcrop of which, about a mile from the town, culverts are sunk capable of storing 50,000 gallons. The water is thence forced by one of Tangye's special pumps to a covered distributing reservoir of 400,000 gallons capacity, which is constructed in duplicate, and situated on a hill close to the town. The mains being constantly charged at sufficient pressure to command any of the houses and public buildings, fire hydrants, stand-pipes, and fountains are distributed through the streets. The water is of excellent quality and ample in quantity. Consumers are at present supplied entirely by meter. The Engineer was Mr. W. H. Y. Webber, of 26, Budge Row, Cannon Street, and the manner in which the whole of the work was executed has given great satisfaction to the Town Council and the inhabitants generally. A public dinner, under the presidency of the Mayor, was held in the evening.

The Proposed Purchase of the Limerick Gas-Works.—The Dublin *Freeman's Journal*, of Friday last, has the following "special telegram," dated Limerick, Thursday:—"The Solicitor of the Corporation, Mr. Connolly, has received a decisive telegram from Mr. Russell, Q.C., replying to a request for an opinion as to whether the Corporation could back out of their engagement to purchase the works of the United General Gas Company, into which the latter had been forced, and for which the Corporation had obtained an Act, under which they were entitled to raise a sum of £54,000 for the purchase of the opposition works. Mr. Russell, replying by telegram, says that he is clearly of opinion that the Limerick Corporation, having obtained an Act which has received the Royal Assent, they are decisively bound to carry out the stipulations of the Act, as he is not aware of anything that could override an Act of Parliament, unless that Act was repealed. Lord Limerick had warned the Corporation to prudence in the recent development of the electric light, and advised them to caution in the opposition works; but it would seem that the warning came too late, Mr. Russell being of opinion that the Corporation were bound to carry out their agreement with the United General Gas Company."

Utilizing the Waste Heat of Exhaust Steam.—At the meeting of the Society of Engineers on Monday the 2nd inst., R. P. Spice, Esq., President, in the chair, a paper by Mr. James Atkinson, on "Apparatus

for Utilizing the Waste Heat of Exhaust Steam," was read. The Author explained the importance of heating the feed-water supplied to boilers by means of the waste heat of the exhaust steam, which is the chief use to which it is put, and he showed that the saving in fuel thereby was never less than 20 per cent. with a really efficient heater, and that the durability of the boiler was increased. He then explained the different kinds of heaters in use. Amongst others he described his patent heater, which consists of a number of straight tubes, screwed into a tube plate, which forms the base of an inclosed cylindrical vessel containing the tubes and the water to be heated. These heating-tubes are closed at their upper ends, but are open at the bottom to the exhaust steam, for which a short direct passage is provided. Small circulating tubes draw any air out of the heating-tubes which would prevent them being filled with steam. The latent heat of a portion of the exhaust steam is transmitted through the heating-tubes to the feed water which is forced through the heater, and passes into the boiler at a temperature of from 210° to 212°. He claimed for it that, whilst it was in no way inferior to others, as proved by practical results attained, it possessed perfect freedom from back-pressure on the engine, greater facilities for cleaning out and examining, a better arrangement for purifying the feed-water, increased durability, greater simplicity in general construction, and consequently greater cheapness in manufacture. He next described the application of the same principle to heating liquids, air, or other gases, for manufacturing purposes, also rooms and buildings, explaining how that could be done, without putting any appreciable back-pressure on the engine, more economically than by the usual methods, and with less risk of leaky joints.

THE LIGHTING OF STUDIOS AND PICTURE GALLERIES.—At the Royal Academy on Monday the 2nd inst., Professor Barff, M.A., delivered a lecture on "Light and what Kind of Artificial Light is Best Adapted for Studios, Picture Galleries, &c." Having briefly and lucidly explained the more important phenomena in connection with the transmission and refraction of light, illustrating his remarks by the aid of the spectroscope, Professor Barff said, with respect to the question which was absorbing so much attention at the present time—electric light—he was of opinion that few of those who listened to him would live to see it in every house, and with all that had been said about banishing their old friend gas, if he had had a few thousand pounds to spare he would not have hesitated to invest it in gas shares. At all events, gas was now the general illuminating agent, and he wished to show what he considered to be the best burner which could be used—Silber burner—which the inventor had now brought to a state of great perfection. By the use of this patent the exact amount of air was allowed to enter the burner which experience had shown had the effect of producing the brightest light, by absorbing the carbon in excess. He then took an ordinary Argand burner, and compared the effect produced by it with the light emitted by the Silber burner, clearly demonstrating the superiority of the latter. He said it was also very important to mention that the Silber burner reduced the amount of sulphuric acid and aceteline given off by gas to a minimum; and as these two gases weres o deleterious in their effects upon pictures, books, and furniture, too much attention could not be given to this matter. To artists it was especially necessary that they should have an artificial light which would enable them to discriminate the various gradations of colours, and the Silber burner was undoubtedly the best invented for that purpose.

GAS LIGHTING IN THE COLONIES.—When proposals were first made, not many years ago, for the establishment of gas-works in the chief towns of our Indian and Colonial possessions, it was freely argued that, as in most of such cases it would be necessary, owing to the want of local supply, to import all the coal required from England, this lighting agent could only be provided at a cost which would be practically prohibitive to its general use. There were but few Colonies which did not produce in large quantities that useful tree, the cocoa-nut palm, and from its well-known nuts, oil could be manufactured in such quantities, and at so low a price, that it was not likely its use would be ever given up for the more expensive, though more convenient, system of gas lighting. Such a fear proved to be illusory, more especially since the opening of the Suez Canal. Our Eastern Colonies have developed such a demand for tonnage, for the shipment to England of their valuable productions, and these have been so largely in excess of the shipments to the mother country, that outward bound vessels have found it exceedingly difficult to obtain outward freights, and their owners have been willing, in many cases, to carry coal from England at rates only just sufficient to pay the Canal dues. Prior, however, to the opening of the Canal, sailing vessels bound to the East, *viâ* the Cape, were equally ready to load with that article for what would just pay the current charges of the journey outwards, relying on the homeward-bound cargo to give them a fair profit. On both these lines, therefore, it was soon found practicable to land coal at such ports as Point de Galle at a total cost of little over £1 per ton—not much in excess of what it could be landed for in the port of London. In several of our Colonies also coal has been discovered in large quantities, and although inferior in most cases to the English article for gas-producing purposes, it was found practicable to use it in a great measure. The consequence has been that there are now but few of the more important towns in our foreign dependencies that do not possess gas-works, and the conveniences of this mode of illumination have insured its free use, to the almost total exclusion, for public purposes, of oil lighting. Madras is almost the only notable exception, but we understand the Duke of Buckingham is now giving its introduction into that important city his earnest attention. Most of such enterprises in the Eastern and Western Colonies have proved to be fairly paying speculations.—*Engineer.*

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

4705.—CHEESBROUGH, F. J., Liverpool, "An improved method or system of distributing, dividing, regulating, controlling, and measuring electric currents, in the practical application of the same to electric lighting and other useful purposes." A communication. Nov. 19, 1878.

4727.—LOWNY, G., Salford, Lancs, "Improvements in rotary engines, pumps, blowers, and meters." Nov. 21, 1878.

4728.—GREATHEAD, J. H., Westminster, and MARTINDALE, M. D., Anerley, Surrey, "Improved means and apparatus for the supply of high-pressure hydrants or stand-pipes." Nov. 21, 1878.

4730.—GENT, J. S., Manchester, "Improvements in gas-burners." Nov. 21, 1878.

4760.—DUNCAN, G., WILSON, W. A. and G. A., Liverpool, "Improvements in gas motors." Nov. 22, 1878.

4762.—SPRAGUE, J. T., Birmingham, "Improvements in machines and appliances for generating electric currents, and in apparatus for measuring electric currents." Nov. 22, 1878.

4774.—PULVERMACHER, I. L., Regent Street, London, "Improvements in and connected with producing light by electricity." Nov. 23, 1878.

4784.—MORGAN-BROWN, W., Southampton Buildings, London, "Improvements in the grouping of burners for gas and other illuminating agents." A communication. Nov. 25, 1878.

4792.—ERICSON, N. W., Stockholm, "Improvements in the utilization of exhaust or other used or spent steam, and in apparatus therefor." Nov. 25, 1878.

4821.—SABINE, R., Hampton Wick, Middlesex, "Improvements in electric lamps or regulators." Nov. 27, 1878.

4843.—FOULIS, W., Glasgow, "Improvements in gas and hydrocarbon engines, and in igniting the gas or hydrocarbon used therein, the means of igniting being applicable for other purposes." Nov. 28, 1878.

4847.—CHEESBROUGH, F. J., Liverpool, "Improvements in and relating to electric lamps, and to a method of charging such lamps with an artificial atmosphere, and purifying the same; and to the production of a carbon for use in electric lamps, and for other electric purposes." A communication. Nov. 28, 1878.

4854.—MAIGNEN, P. A., Great Tower Street, London, "Improvements in the construction and arrangement of apparatus for filtering water and other liquids." Partly a communication. Nov. 28, 1878.

4862.—ASHBY, A., Grantham, Lincoln, "Improvements in the softening of water." Nov. 29, 1878.

4893.—WATES, P. J., Greenwich, "Improvements in appliances for removing the pressure upon gas-retorts by the dip-pipes generally in use." Nov. 30, 1878.

4895.—ROYLE, J. J., Manchester, "Improvements in diminishing valves and unions or joints for steam, water, and other pipes." Nov. 30, 1878.

4899.—LAKE, W. R., Southampton Buildings, London, "Improvements in and relating to joints or unions for pipes or tubes." A communication. Nov. 30, 1878.

4900.—LAKE, W. R., Southampton Buildings, London, "Improvements in water-meters." A communication. Nov. 30, 1878.

4901.—BREEDEN, J., Birmingham, "Improvements in holders or galleries for globes and shades for gas and other lights." Nov. 30, 1878.

4902.—SCHLEH, E., Ehrenfeld, Germany, "Improvements in apparatus for collecting and discharging fœcal matters from dwellings, and for rendering innocuous the gases arising therefrom." Dec. 2, 1878.

4949.—SIEMENS, C. W., Westminster, "Improvements in electric lamps." A communication. Dec. 4, 1878.

4952.—GOODSON, H. E. T., Fulham, London, "A new or improved automatic apparatus for preventing waste of water in water-closets." Dec. 4, 1878.

4960.—NEWTON, A. V., Chancery Lane, London, "Improvements in apparatus for generating electric currents, and for producing electric light." A communication. Dec. 4, 1878.

4979.—SIMON, R., and BEECHEY, C. G., Nottingham, "Improvements in and connected with gas or hydrocarbon engines." Dec. 5, 1878.

4988.—THOMPSON, S. P., Bristol, and THOMPSON, W. P., Liverpool, "Improvements in or appertaining to apparatus for producing or concentrating electricity, and in the production of electric light, or compound electric and combustion light." Dec. 5, 1878.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

2030.—PRESTON, F. P., PRESTIGE, J. T., PRESTON, E. J., Deptford, Kent, and DALBY, J., Ipswich, Suffolk, "Improvements in steam engines and pumps." May 21, 1878.

2037.—CLAYTON, S., Bradford, "Improvements in gas motor engines, and in apparatus connected therewith." May 22, 1878.

2090.—LAKE, W. R., Southampton Buildings, London, "An improved gas and water meter." A communication. May 24, 1878.

2180.—SWEET, A., St. Pancras, London, "Improvements in cooking and heating by gas." May 31, 1878.

2231.—HEATON, C. W., Lessness Heath, Kent, "Improvements in purifying gas, and in apparatus employed therein." June 4, 1878.

2233.—NEWTON, W. E., Chancery Lane, London, "Improved apparatus for exhausting or impelling liquid or gaseous bodies." A communication. June 4, 1878.

2285.—VACHEROT, A., Battersea, London, "Improvements in rotary engines, rotary pumps, and other like apparatus." June 7, 1878.

2350.—ABEL, C. D., Southampton Buildings, London, "An improved manufacture of combustible gas for illuminating and heating purposes, and apparatus and lamps employed for that purpose." A communication. June 13, 1878.

2399.—THOMPSON, W. P., Liverpool, "Improvements in and appertaining to the obtaining of light by means of electricity, and in apparatus therefor." A communication. June 17, 1878.

2477.—WERDERMANN, R., Princes Street, Surrey, "Improvements in apparatus for electric lighting." June 21, 1878.

2733.—WISE, W. L., Adelphi, London, "Improvements in treating impure water or liquid to purify the same, which improvements are especially applicable to the treating of sewage to obtain certain products therefrom." A communication. July 8, 1878.

3524.—SHONE, I., Wrexham, Denbigh, "An improved system of sewerage, and apparatus to be employed therefor." Sept. 5, 1878.

3722.—CROWNSHAW, W. J., Sheffield, "Improvements in adjustable spanners." Sept. 20, 1878.

4196.—HADDAN, H. J., Westminster, "Improvements in waste-plugs." A communication. Oct. 21, 1878.

4204.—HADDAN, H. J., Westminster, "Improvements in valves and cocks." A communication. Oct. 22, 1878.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

3969.—EAGLESHAM, J., and RIGG, H., "A new and improved mode and means or apparatus for cooling or lubricating air or gas pumping machinery." Nov. 15, 1875.

3978.—BONNEVILLE, H. A., "A new or improved apparatus for measuring water or other liquids." Nov. 16, 1875.

4008.—ASHTON, H., "New or improved taps and valves combined." Nov. 18, 1875.

4044.—GRUNDY, G., "Improvements in carburetters." Nov. 20, 1875.

4059.—ARMSTRONG, R., KELLETT, H., and MACFEGGAN, W. S., "Improvements in pumps, and in the apparatus to be used in connection therewith." Nov. 22, 1875.

4083.—THORNELOE, G., "Improvements in gas, water, and steam valves." Nov. 25, 1875.

4126.—BUTT, J. M., and HERRING, J., "Improvements in apparatus used in the purification of gas." Nov. 27, 1875.

PATENT WHICH HAS BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

3130.—EMMENS, S. H., "Improvements in purifying distillates from carbonaceous or bituminous substances." Nov. 18, 1878.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

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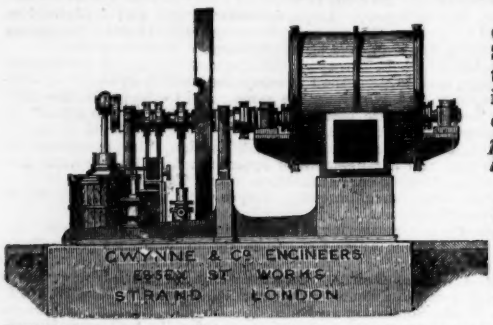
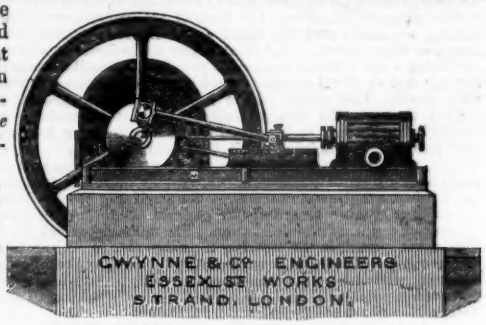


EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

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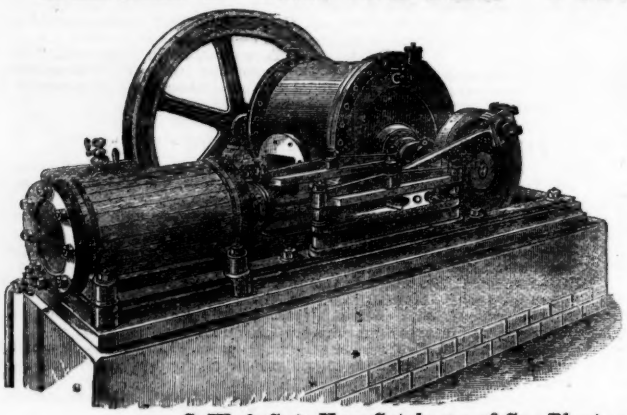

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In this Wet Meter the drum or wheel is of the plain ordinary form, and not cut up or divided out into a complicated series of chambers, and there is an absence of overhung or other revolving apparatus to effect the compensatory action.

Without increasing the size of the Meter, a water reservoir for compensation is provided, which, under ordinary conditions, will, without attention, keep the Meter working for ten to twelve months with an unvarying water-line.

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WANTED, a Tar Stillsman, Must be thoroughly efficient in Tar distillery, and well up to the work of a yard. To an intelligent, handy man, good wages would be given.
Address, enclosing copies of references, to Mr. JOHN G. HARVEY, Manager, Chemical Works, Little Island, Cork.

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WANTED, a gentleman with a good connection amongst Gas Managers to represent a London firm, whose material is largely used. Liberal terms.
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WANTED, One or Two Gas-fitters for Interior Fittings — Iron and Compo Tubing. Fitters who can repair Meters and take Indices preferred. Wages 25s. to 28s., according to ability. References required.
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WANTED, Main and Service Layers. Preference will be given to those who understand Fixing Meters and taking Pressures.
State wages required, and when they can enter upon their duties.
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WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.
John Leigh, Esq., M.R.C.S., F.C.S., &c ,&c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash and when Cannel of the best description is scarce, it may well replace this material."

CAST-IRON Borings, best quality, any quantity, delivered to any railway station in England. SAMUEL HAYWARD, New Park Street, LONDON, S.E.

THE Woolton Gas Company have for disposal a quantity of GAS PLANT suitable for a small Gas-Works. Consisting of Hydraulic Main, Mouthpieces, Ascension-Pipes, 6-in. Condensers, Scrubber, set of four Purifiers, 5 ft. square and 3 ft. deep, with Grids and Centre-Valve, complete. All the above is in good order, having recently been replaced by larger plant.
All information may be obtained from the undersigned, at the Gas-Works, Woolton, near Liverpool.
HENRY HATCH, Manager.

TENDERS FOR TAR AND LIQUOR.

THE Directors of the Grantham Gas and Coke Company are prepared to receive TENDERS for the Purchase of their Surplus TAR and AMMONIACAL LIQUOR for One, Two, or Three years, from Jan. 1, 1879. The quantity of coals carbonized in twelve months, about 4000 tons.
Tenders to be sent to the Manager not later than Dec. 20th, 1878, endorsed "Tender for Tar, &c."
Any further information may be obtained on application to
W. BARRATT, Engineer and Manager.
Gas-Works, Grantham, Dec. 6, 1878.

STATION-METER FOR SALE.

THE Gas Committee of the Rochdale Corporation offer for SALE a STATION-METER, capacity 25,000 cubic feet per hour, 12-in. Connections, Hydraulic Valves, and Bye-Pass, and all other necessary fittings. The Meter to be removed in consequence of extensions.
Any further information thereon can be had from the Manager at the Works.
Tenders, endorsed "Tender for Station-Meter," must be sent to me. By order,
ZACH. MELLOR, Town Clerk.
Town Hall, Rochdale, Aug. 2, 1878.

TENDERS FOR SULPHATE AMMONIA.

THE Directors of the Cork Gas Con- sumers Company are prepared to receive TENDERS for all the SULPHATE AMMONIA to be manufactured at their Works during the year 1879. Delivery f.o.b. Cork. Probable quantity, 100 tons. Payment, net cash on delivery. Price to be fixed on basis of 24 per cent. ammonia, and tenders to state whether packages are to be supplied free by sellers.
Tenders will be received up to Friday, Dec. 27, 1878.
By order,
DENNY LANE, Secretary.
Company's Offices, 72, South Mall, Cork,
Nov. 30, 1878.

BOROUGH OF HALIFAX.

THE Gas Committee of the Halifax Cor- poration invite TENDERS and DESIGNS for a CYLINDRICAL TOWER SCRUBBER to be 60 ft. high and 12 ft. in diameter, with 18-in. Valves and Connections, Staircase, &c., all complete; to pass 60,000 cubic feet per hour.
The Contractor must state price per ton at which he will supply and fix the necessary 18-in. pipes and connections for connecting the Scrubber with the rest of the apparatus.
Further particulars may be had from Mr. Wm. Carr, Manager, at the Gas-Works.
Tenders must be sent to me on or before Thursday, Dec. 26, 1878. By order,
A. C. FOSTER, Town Clerk.
Town Hall, Halifax, Nov. 30, 1878.

TO TAR DISTILLERS, AMMONIA MANUFACTURERS, AND OTHERS.

THE Gas Committee of the Wigan Cor- poration offer for SALE, for a term of Three, Five, or Seven years, the TAR and AMMONIACAL LIQUOR produced at their Works.
The Committee reserve to themselves the right to sell by retail such quantities of tar and liquor as they think proper for their ordinary customers.
The highest or any offer not necessarily accepted.
Separate offers must be sent in for each article, addressed to the undersigned, not later than the 19th inst., and endorsed "Tender for Tar" or "Tender for Ammoniacal Liquor," as the case may be.
J. G. HAWKINS, Manager.
Dec. 1, 1878.

THE Gas and Water Committee of the Ramsgate Improvement Commissioners are desirous of receiving TENDERS for the Surplus TAR made at their Works, Jan. 1, 1879, to Dec. 31, 1879.
The storeage room on the Works is about 20,000 gallons, and no more than that quantity can be allowed to accumulate. The surplus Tar for the year will be about 60,000 gallons.
Tenders to be sent in not later than the 19th inst., addressed to the Chairman of the Committee, and endorsed "Tender for Tar."
The Contractor will be required to make payment in advance. Forms of cont act may be obtained on application to the undersigned.
The Committee do not bind themselves to accept the highest or any tender.
WILLIAM A. VALON, Engineer and Manager.
Gas and Water Department, Hardress Street,
Ramsgate, Dec. 6, 1878.

TO CONTRACTORS AND BUILDERS.

THE Watford Local Board of Health are desirous of receiving TENDERS for the construction of a Brick, covered RESERVOIR, to contain about one million gallons.
Plans and specification can be seen and forms of tender obtained on and after Wednesday, the 11th of December, on application to Mr. C. C. Lovejoy, Surveyor to the Board, between the hours of ten a.m. and four p.m., at the Local Board Water-Works.
Tenders on the printed form to be delivered at my office, not later than six m.p., on Thursday, January 16, 1879.
The Board do not bind themselves to accept any tender.
By order of the Board,
JOHN SEDGWICK, Clerk.
Watford, Dec., 1878.
N.B.—Copies of the Specification can be had of the Surveyor at 7s. 6d.

GAS TAR AND LIQUOR.

THE Directors of the Sheppy Gas Com- pany invite TENDERS for the Purchase of the whole of the AMMONIACAL LIQUOR made at their Works, and the Surplus TAR, not disposed of by retail, or under Government contracts, during the year 1879; being about 50,000 gallons of Liquor, of the strength of from 5 to 8 degrees, and 30,000 gallons of Tar, more or less. The Tar and Liquor will be pumped into tank-barges, free of expense, alongside the Company's Works, West Minster, on the bank of the Medway, between Sheerness and Queenborough. The prices tendered to be, per degree Twaddel per 1000 gallons of Liquor, and per gallon of Tar. Payment to be by cash, on delivery of each quarterly account.
Tenders to be addressed to the "Chairman of the Sheppy Gas Company," and delivered at the Office, 2, Trinity Road, Sheerness-on-Sea, before three o'clock p.m., on Saturday, Dec. 21, 1878.
The Directors do not bind themselves to accept the highest or any tender.
By order of the Directors,
A. W. MARKS, Secretary.
Company's Office, Dec. 4, 1878.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Plymouth and Stonehouse Gaslight and Coke Company are prepared to receive TENDERS for the Purchase of the Surplus TAR produced at their Works for One, Two, or Three years, from Jan. 1, 1879. A separate quotation should be named for each of the aforesaid periods.
The Company will deliver the Tar through their main into the Contractor's vessels at the Creek, Sutton Pool, or into his carts on their Works, free. Payments to be made in cash, monthly.
The Directors may require the Contractor to find security for the faithful performance of his contract.
Further particulars can be obtained on application to the Secretary, at the Company's Offices, 1, Athenæum Terrace, Plymouth, to whom tenders, endorsed "Tender for Tar," are to be sent on or before Wednesday, the 18th inst.
The Directors do not necessarily engage to accept the highest or any tender.
By order,
JOHN THOMAS, Secretary.
Gas Offices, 1, Athenæum Terrace,
Plymouth, Dec. 6, 1878.

THE ELECTRIC LIGHT.

LETTERS ADDRESSED TO THE EDITOR OF THE "JOURNAL OF GAS LIGHTING," &C., BY
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A LECTURE

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Engineer and Manager of the Salford Corporation Gas-Works.

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TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.
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T. Stone, Esq., of Weymouth, writes on Nov. 17, 1878: "I have used about 12,000 tons of this Coal, with, I think, the best possible results, although not always under the most favourable circumstances. My Coal account made up to Midsummer last showed a makeage of 10,524 cubic feet per ton of 14½-candle gas, and not a hundredweight of Cannel used. This statement would, I know, be incredible to many men, and may provoke the remark, 'How much of it is paid for?' For the gratification of such, I have to say that, of the above quantity, 9866 cubic feet per ton of Coal carbonized were brought to charge and duly paid for, with the exception of about 6s. per cent. for bad debts. The coke is of excellent quality. The above facts I hold to be a greater recommendation to your Coal than any words of mine could be."

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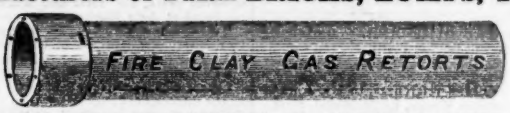

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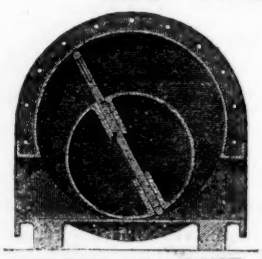

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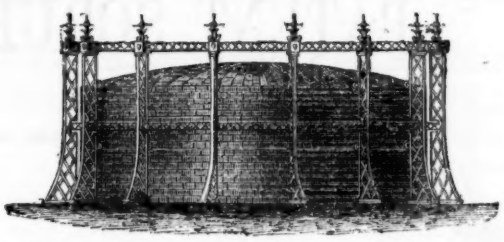

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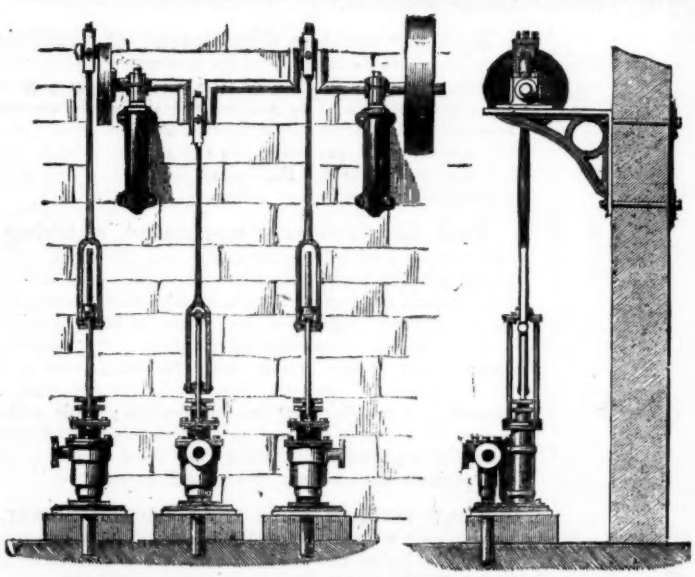
PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT DIRECT-ACTING STEAM-PUMPS.



IMPROVED DOUBLE-ACTION PUMPS.
For Water. For Tar. For Ammoniacal Liquor.

This illustration shows an arrangement of three (No. 179) Improved Double-Action Pumps driven from the same crank-shaft, as frequently supplied for use in Gas and Chemical Works. The suction and discharge pipes can be arranged for drawing from and delivering in any required direction.

These Pumps have been supplied to nearly all the large Gas Companies and Chemical Works, both for Pumping Water, Tar, and Ammoniacal Liquor.

AS SYPHON PUMPS, IN COPPER OR SHEET IRON, ALWAYS IN STOCK.

Illustrated Catalogues sent post free on application.

YEO'S PATENT ENGINE PACKING,

Price 1s. 8d. per lb., any size.
Tarred & White Spun Yarn for Pipe Joints, at various prices.
Samples and testimonials free per post.
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MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS, &c.,

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Also Makers of all kinds of Common Building Bricks, and of Pressed White and Red Bricks for Facing.

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TAR DISTILLERS & MANUFACTURING CHEMISTS,

MILES PLATTING, MANCHESTER.

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BUYERS OF COAL TAR,
And Crude Products therefrom,
AMMONIACAL LIQUOR, &c.

BIRTLEY IRON WORKS,

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Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

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JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

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Keep in London and at their works large stocks of PIPES and CONNEXIONS (1½ to 36 inches in diameter); also make and supply Retorts, Tanks, Columns, Girders, Special Castings required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

CHARLES HORSLEY, Agent.

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SILICA FIRE-BRICK CO.,

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Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

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Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.

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BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.

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Of all Dimensions for Gas-Works,

GLASS-HOUSE POTS & CRUCIBLES

Of every kind.

The Highest Award was obtained by H. & M., at the Philadelphia Exhibition, 1876, for Superior Quality of Manufacture.

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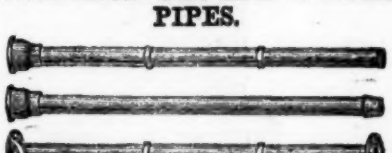
CAST-IRON GAS AND WATER PIPES.



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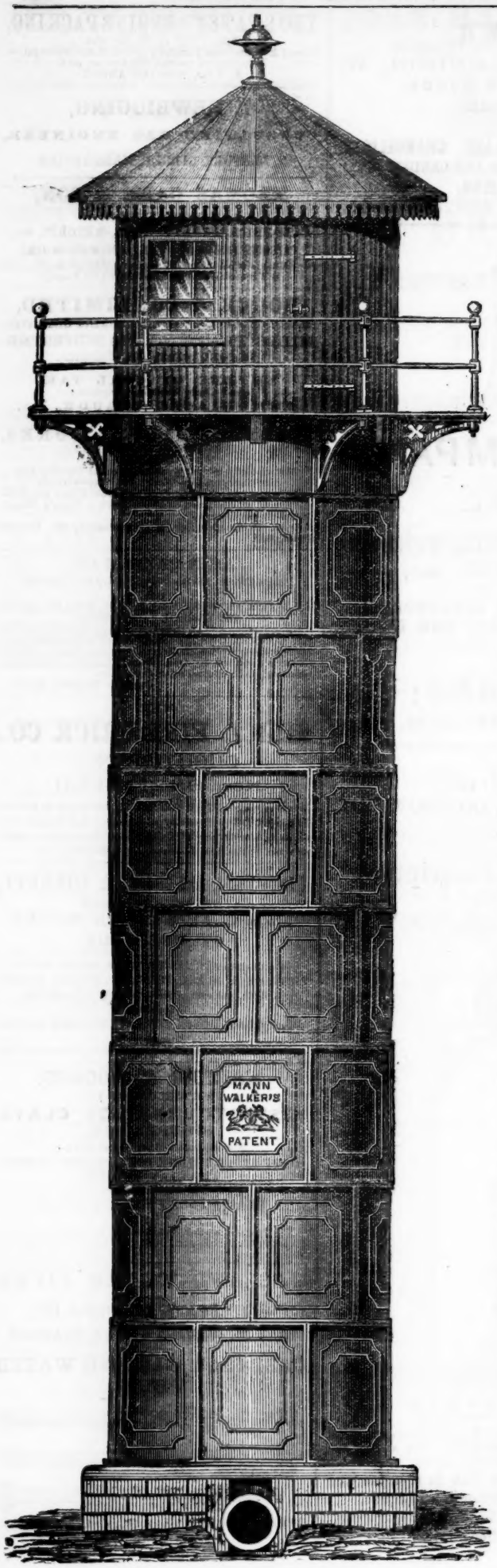
Prices on application.



C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the im-portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, re-quiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours or a winter's day, and the smallest make on a summer's day, to be purified.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

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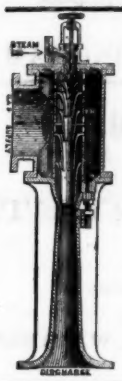
Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.

STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.



KÖRTING'S STEAM-JET EXHAUSTER.

IMPROVED CLELAND'S PATENT.

UPWARDS OF 300 IN USE.

CLELAND'S SLOW-SPEED CONDENSER & STEAM SCRUBBER.

FOR PARTICULARS, APPLY TO

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SOLE AGENT FOR ENGLAND AND WALES.

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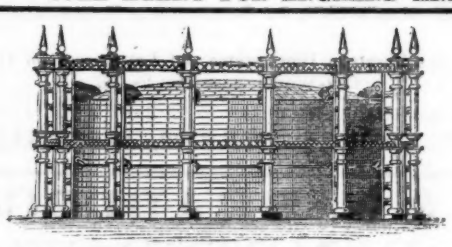

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ASHMORE & WHILE,

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MANUFACTURERS OF GASHOLDERS,

GAS APPARATUS OF EVERY DESCRIPTION,

Including Improved

Retort-Lids, Boilers, Cast and Wrought Iron Tanks, Iron Roofing, Bridges, Girders,

And GENERAL IRONWORK.

N.B.—Estimates for all Gas Plant and Remodelling supplied on application.

CLOTH GAS-BAGS FOR MAINS,

As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather, India-Rubber, and Gutta-Percha Machine-Bands, Sheet and Washers, and Steam Joints.

T. BUGDEN, Manufacturer,

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TORBAY AND DART PAINT COMPANY, LIMITED.

WORKS:

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SOLE PROPRIETORS AND MANUFACTURERS OF

WOLSTON'S CELEBRATED

TORBAY IRON PAINTS.

TRADE MARK

These Paints have been for many years extensively used in Her Majesty's Royal Dockyards, Woolwich Arsenal, the Shorncliffe and Curragh Camps, War Departments, and Colonies, and are largely supplied to Railway, Harbour, and GAS COMPANIES, Shipowners, Engineering Establishments, Railway Carriage and Wagon Works, and the Paint Trade generally. They are the BEST PROTECTORS of WOOD, CEMENT, and IRONWORK, even arresting corrosion after it has set in; and their base being oxide of iron, they are free from those properties which make lead paints so destructive to iron. They do not scale or blister, are not affected by great heat, and are the only Paints which will resist the effects of sulphuretted hydrogen. Their DURABILITY and covering properties have borne the test of A QUARTER OF A CENTURY'S PRACTICAL TRIAL.

The undermentioned colours—ground in best linseed oil, and requiring only to be thinned down for use in the ordinary way—are kept in stock:—

Torbay Brown.	Torbay Red.
Dart Green.	Slate.
Dart Yellow.	Buff.
Brixham Black.	Torbay Chocolate.
Light Blue.	Cream Colour.
Dart Brown.	Dart Umber.
Imperial Stone.	Light Stone.
Bronze Green.	Salmon Colour.
Navy Green.	Lead Colour.
Carriage Red.	Dark Stone.
Light Lead.	Crystal Palace Blue.
Light Green.	Iron Grey.

All other Colours made to order.

READY-MIXED PAINTS.

A great variety of Colours ready mixed for the brush are also always kept in Stock, in 3 lb., 7 lb., 14 lb., and 28 lb. cans.

Prices and Testimonials on application.

GAS PURIFICATION

BY

OXIDE OF IRON.

COOKE BROTHERS

Beg to draw the attention of Gas Companies to the following certificate, relative to the quantity and quality of their Oxide, from the Assistant Surveyor of the County of Donegal:—

"*Londonderry, Oct.* 12, 1878.

"I have examined some of the deposits of iron ore in the following localities in the county of Donegal, over which Messrs. Cooke Brothers hold exclusive royalties for raising the ore—namely, several townlands in the Barony of Kilmacrenan, including the estate of Viscount Southwell, in the Barony of Raphoe, the estates of Sir Samuel Hayes and Colonel Montgomery, in the Barony of Ennishowen, several townlands on the estate of Mr. Newton—and I certify that the several estates are rich in Oxide; that the ore is of a very good quality, such as is usually shipped from this county; that the districts, which are very extensive, are capable of producing a large supply; in fact, the supply of ore on these estates is practically inexhaustible.

(Signed) "PHILIP M'LAUGHLIN, *Assistant County Surveyor.*"

COOKE BROTHERS beg to state they are also in possession of several other exclusive sources of supply, independent of those included in the above certificate.

26, 27, *and* 28, *Fenchurch Street, London, E.C., Oct.*, 1878.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full Analyses on application.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,

CANNEL COAL MERCHANT,

HAYMARKET, EDINBURGH.

Established 1840.

DEAN'S PRIMROSE GAS COALS.

South Metropolitan Gaslight and Coke Company, London, July 12, 1878.

The Owners of the Dean's Primrose Colliery.

Dear Sirs,—I have much pleasure in stating that this Company have regularly used your Coals for more than thirty years, and that in all essential particulars they give the most satisfactory results.

The yield of Gas is from 9700 to 9800 feet per ton, of full 16 candles illuminating power, tested by the London Referees Standard Burner; and the Coke is of very good quality, while the quantity is about 40 bushels to the ton of Coal.

I consider Dean's Primrose Coals to rank amongst the first-class Gas Coals from the Durham Coal-Field.

Yours truly, GEORGE LIVESEY.

These Coals are also used by The Gaslight and Coke Company (London), and other English and Foreign Gas Companies.

Steamers loaded with quick despatch in the River Tyne.

Price and other terms on application at the

FITTING OFFICE, NEWCASTLE-ON-TYNE.

HOLMSIDE GAS COALS.

South Metropolitan Gaslight and Coke Company, 589, Old Kent Road, London, S.E., Oct. 9, 1873.

At the request of Mr. Hedley, the owner of the Holmside Colliery, I have much pleasure in stating that, for about ten or twelve years past, this Company has taken at least half of its supply of Newcastle Coal from him. I can, therefore, confidently bear testimony to the good quality of the Holmside Coals, and consider they are equal to the best of the Newcastle Coals, in proof of which I may state that this year we are using those Coals exclusively, that the yield of Gas is from 9700 to 9800 feet per ton, and that the quality of the Gas, without any admixture of Cannel, is over 16 candles, as tested by the officer appointed by the Metropolitan Board of Works, using the London Gas Referees test.

The Coke is of excellent quality, and in quantity amounts to about 40 bushels from a ton of Coal.

The annual consumption of Coal amounts to about 75,000 tons.

GEORGE LIVESEY, Engineer and Secretary.

P.S.—I am at this date, Feb. 15, 1875, still using Holmside Coals as largely as ever, and am quite as well pleased with them as when I gave the above certificate.

GEORGE LIVESEY.

We are this year, 1878, using 50,000 tons of Holmside Coal. GEORGE LIVESEY.

FITTING OFFICE:

Address, 75, QUAYSIDE, NEWCASTLE-ON-TYNE

M. BREMOND'S NAPHTHALINE PROCESS.

A negotiations respecting M. Brémond's patented process for preventing Deposits of

NAPHTHALINE

in Gas Main and Service Pipes should be addressed to Mr. W. H. BENNETT, 22, Great George Street, WESTMINSTER, S.W., or to M. BREMOND, Gas Engineer, Companie Madrilena de Alumbrado y Calefaccion por Gas, MADRID, who may be consulted upon all matters connected with the Gas Industry.

FERRAND DAVIES,

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AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

AND

NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.

Analyses and Quotations on application.

WILSON CARTER AND PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

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WESTMINSTER, S.W.,

PATENTEE and MANUFACTURER of the following Invention

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Eighteen Illustrations and Letterpress on the Construction of Gas-Works, post free, 2s. 6d.

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

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J. & J. BRADDOCK,

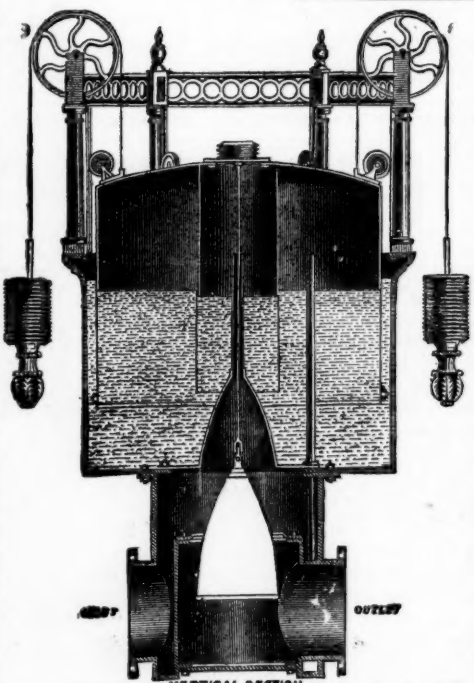
GLOBE METER-WORKS,

OLDHAM,

Beg to submit to Gas Engineers their

PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 24-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

THE SILKSTONE & DODWORTH COAL & IRON COMPANY, LIMITED,

DODWORTH, BARNSLEY.

BENJAMIN WHITWORTH, Esq., M.P. . . . . Chairman.
Mr. RICHARD HARTLEY . . . . . Managing Director.

REAL OLD SILKSTONE GAS COAL.

JAMES PATERSON Esq., Gas Engineer, of the Warrington Gas Company, reported, Aug. 10, 1875:—

"This Coal possesses remarkable qualities as a gas and coking coal, and appears SECOND TO NONE IN THE KINGDOM. It contains the large quantity of 699 lbs. of illuminating matter, and 1498 lbs. of coke to the ton, and produces **12,240** cubic feet of 16·66 candle gas."

The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

PRICES QUOTED TO ANY RAILWAY STATION, OR F.O.B. HULL, GRIMSBY, GOOLE, KEADBY, LIVERPOOL, AND FLEETWOOD.

PARIS EXHIBITION, 1878.

THREE MEDALS

AND

HONOURABLE MENTION

HAVE BEEN AWARDED TO

JOSEPH CLIFF & SONS

For their Various Exhibits, amongst which is a

SILVER MEDAL

FOR THEIR

PATENT MACHINE-MADE

RETORTS AND FIRE-BRICKS,

Being the Highest Honour given for this class.

Established

1795.

JOSEPH CLIFF & SONS,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

London Wharf: No. 4, inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to their compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

THE

SILBER LIGHT COMPANY, LIMITED,

49, WHITECROSS STREET, LONDON, E.C.,

Manufacturers of SILBER BURNERS FOR COAL OR AIR GAS, & FITTINGS.

No. 285.

The Silber Tubulated Gas-Burner.

The *World* says: "The light given by these Burners, besides being abundant in quantity, is almost like sunlight in its quality, so that it produces the same spectrum when refracted through a prism, and allows even the most delicate shades of colour to be distinguished."

Dr. W. WALLACE, F.R.S.E., F.C.S., says: "It gives the steadiest flame of any Argand yet constructed."—*Vide* Report presented to the Dublin Meeting of the British Association, Aug. 15, 1878, "On the Best Means for the Development of Light from Coal Gas of Different Qualities."

No. 291.

The Silber Tubulated Gas-Burner, with Opal Shade and Cup and Governor attached.

The *London Medical Record* says: "This uniform blending of the air with each part of the flame results in rendering it pure and white, and very considerably lessens the blue colour, which is significant of waste, and which is very plainly visible at the base of all imperfect lights. The creation and the maintenance of this white light—not yellow light—is a proof of perfect combustion.

No. 286.

The Silber Bat's-wing Gas-Burner

The *Sanitary Record* says "Mr. Silber's improvements render it possible to eliminate, as far as is practicable, the sulphuric acid due to the incomplete combustion of impure gas."

The *British Medical Journal* says: "In the whole of Mr. Silber's inventions there is noticeable a complete attention to, and adoption of, natural laws."

THE SILBER LIGHT COMPANY, LIMITED,

Are also Manufacturers of every description of Lamps for Railways, Ships, Streets, Churches, and Domestic Purposes.

NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS AND COLLIERIES,

NEAR SHEFFIELD.

CELEBRATED SILKSTONE GAS COALS.

The various descriptions of Gas Coal produced from the above Collieries possess an unequalled reputation, combining in a large degree the constituents essential for the production of the best quality of Coke and Gas of a high illuminating power.

A recent extensive development of the Collieries enables us to offer increased supplies.

JAS. PATERSON, Esq., of Warrington, after testing various qualities of our Coal, has sent the following testimony of their merits:—

"*Warrington Gaslight and Coke Company,*
Offices, Mersey Street, Warrington, April 23, 1877.

"MESSRS. NEWTON, CHAMBERS, AND CO.,

"GENTLEMEN,—After carefully testing the various samples of Gas Coals sent from your Collieries for analysis, I have pleasure in reporting them as belonging to the highest class of Gas and Coking Coals.

"The average of Nine samples gives a yield of **12,500** cubic feet of **15½**-Candle Gas, being equivalent to **664** lbs. of sperm per ton, and **1420** lbs. of fixed carbon of a very superior quality. All the samples bear a close relation to each other in value.

"Yours truly, "JAMES PATERSON."

Full particulars will be sent on application to us—address as above.

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DRY GAS-METERS,

PRIZE MEDALS.
LONDON, 1851;
NEW YORK, 1853
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(INVENTED & PATENTED IN 1844,)

COMBINING ALL THE LATEST IMPROVEMENTS,

MANUFACTURED ONLY BY

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THE GAS-METER COMPANY, LIMITED,

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ALEXANDER WRIGHT & CO.,

MANUFACTURERS OF

"WET" AND "DRY" GAS-METERS,

STATION-METERS, AND GOVERNORS.

METERS, BOXES, REGULATORS, AND ALL REQUISITES FOR PUBLIC LIGHTING.

TESTING APPARATUS for all purposes relating to Gas, &c.

MR. VERNON HARCOURT'S COLOUR TESTS,

Descriptive particulars, per post, 2d.

55, 55a, & 56, MILLBANK STREET, WESTMINSTER, LONDON, S.W.

R. LAIDLAW AND SON,

EDINBURGH AND **GLASGOW.**

Manufacturers of

CONSUMERS IMPROVED WET GAS-METERS,

THE UNVARYING WATER-LINE GAS-METERS,

IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;

STATION-METERS, ALL SIZES, up to 15 feet Square, with PLANED JOINTS;

Experimental Meters, Photometers, Pressure-Gauges, Governors, Test Holders, &c., &c.

LONDON OFFICE: 106, CANNON STREET, E.C.

IMPROVED HYDRAULIC CRANES,

Effecting a great saving in the cost of discharging Coals from Vessels, Barges, &c. Several of these Cranes, with the necessary power, are now being erected at the Beckton Gas-Works.

DIRECT-ACTING HOISTS

For LIFTING RAILWAY WAGGONS to RETORT-HOUSE STAGEWAY; CAPSTANS for HAULING WAGGONS, &c.,

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London: Printed by WALTER KING, for the Executors of the late WILLIAM BOUGHTON KING (at the office of Clayton and Co., 17, Bouverie Street, Fleet Street); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, December 10, 1878.